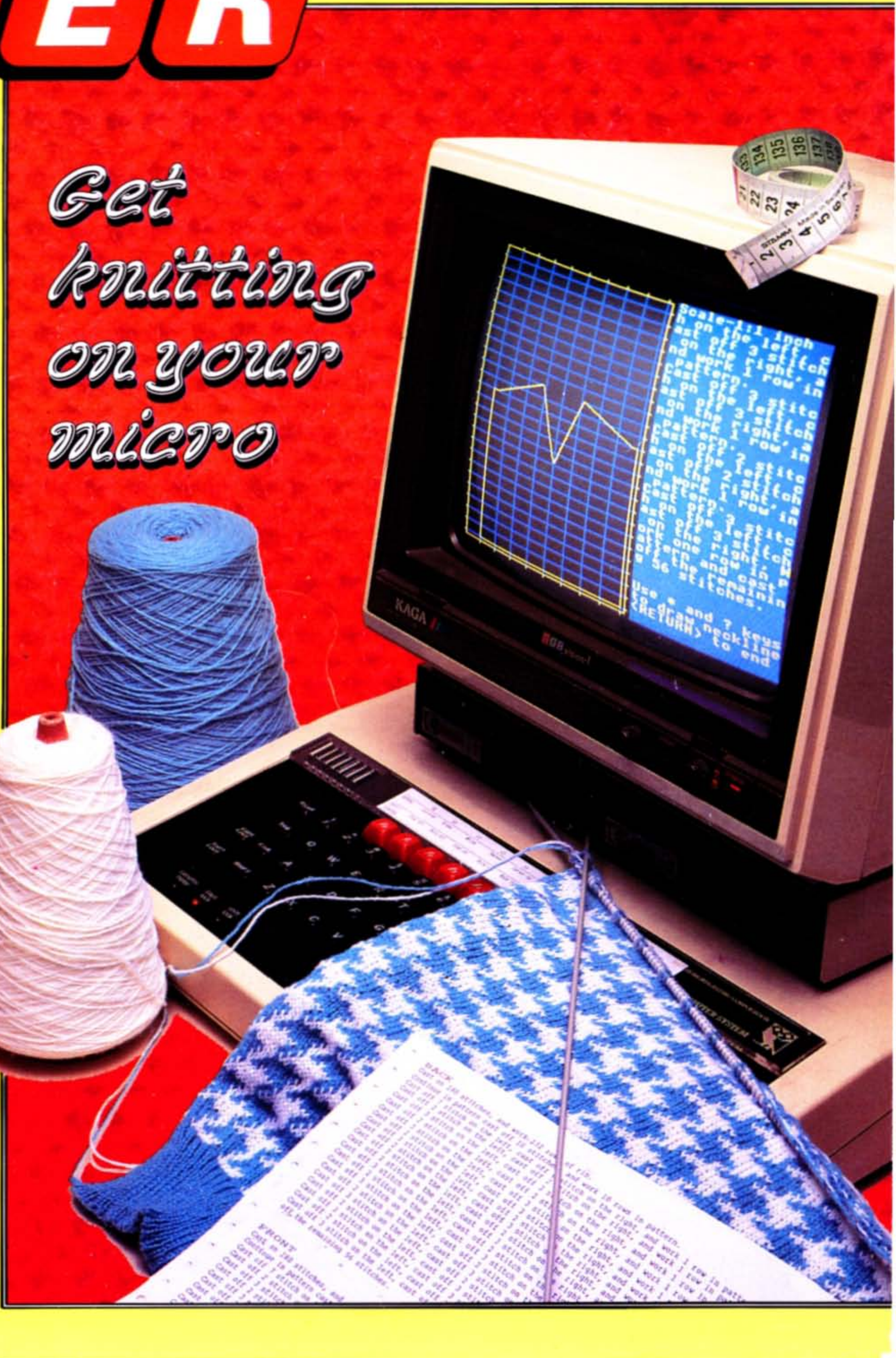
A Database Publication

THE MICRO USER

Volume 5
Number 4
June 1987
£1.25

Top-selling guide to the BBC Micro!



Get knitting on your micro

UTILITY

Putting programs in sideways ram

GAME

Face the challenge of the mad maze

CHECKSUMS

All your listing problems solved

ROMS

What they are . . . How they work

REVIEWS

Dress designer, EpromRyter and the latest games

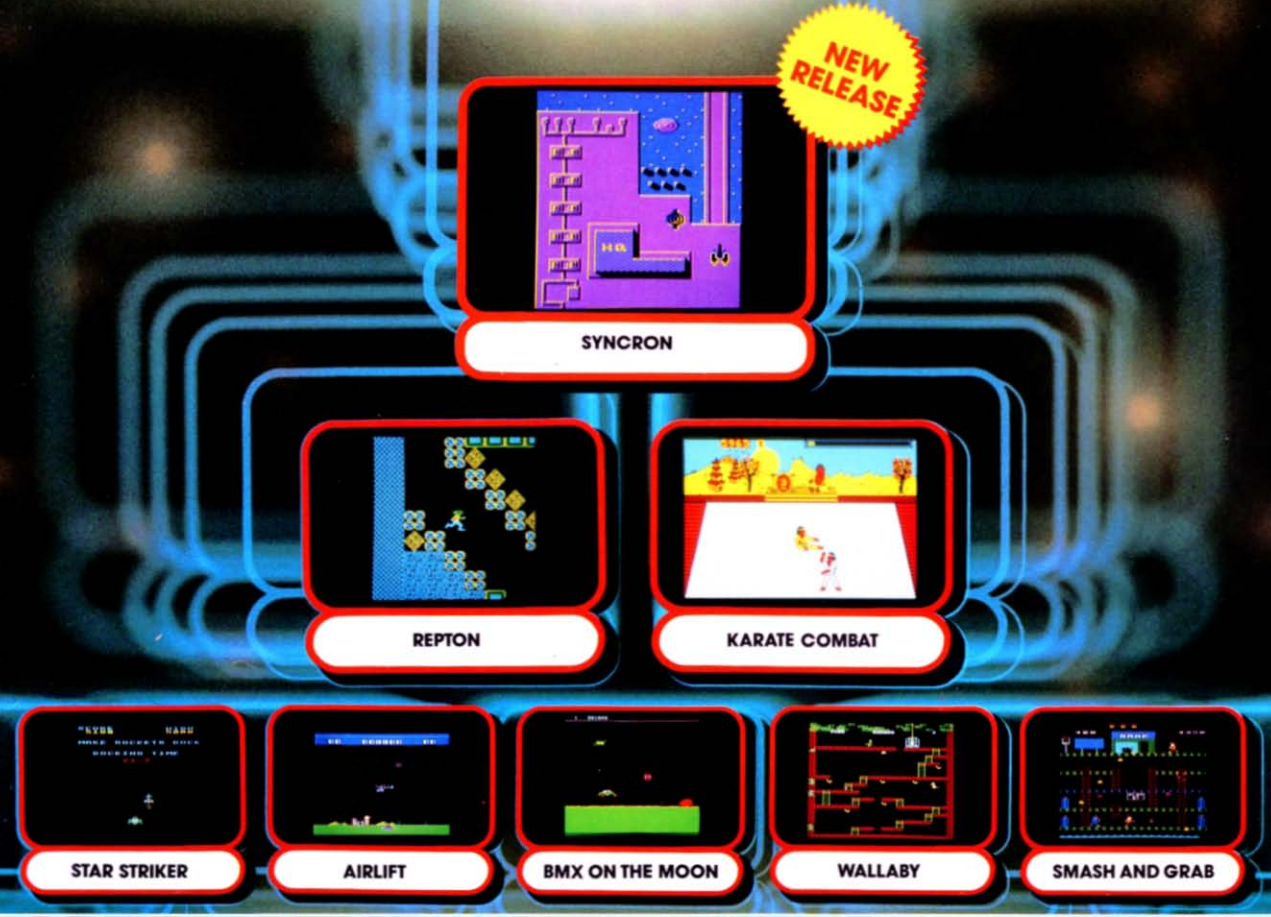
FUTURE

The RISC machine: Acorn's passport to prosperity?

The Superior Collection

Volume 1

For the BBC Micro



A New Concept in Compilations

The Superior Collection Volume 1 features one brand new game, Syncron, together with 7 of Superior Software's classic hits for the BBC Micro.

Syncron is a fast-action game set against a backdrop of an enormous graphically-detailed scrolling landscape. The landscape is, in total, 1024 times the size of the screen. You must endeavour to complete 16 hair-raising missions; in each mission you have to collect a number of power cylinders, land your spacecraft on a runway with each cylinder in turn, and finally locate and bomb the HQ Building. Whilst skilfully manoeuvring your spacecraft between the defence pylons and force-fields, you are attacked by alien spacecraft and missiles launched from the land bases. A superb game, worth at least £7.95 in its own right.

BBC Micro dual cassette	£9.95
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BBC Master Compact 3½" disc	£14.95

Here's what the computer press said about some of the other titles on this compilation package:—

REPTON: "This is an astounding game reaching new heights in BBC arcade adventures." ... MICRO USER

KARATE COMBAT: "Superior's Karate Combat is a superb karate simulation.

Graphics 9
Sound 9
Value 8
Playability 10."
... COMPUTER & VIDEO GAMES

C+VG HIT!

AIRLIFT: "Airlift is an excellent arcade game ... It has a very polished presentation that cannot fail to impress and has the element of addictiveness which keeps you going back for one more try."
... A & B COMPUTING

SMASH AND GRAB: "As usual with Superior products the graphics are excellent, with a good use of colour and no flicker. I expect this game will have you rolling with laughter. I certainly did.

Instructions	95%
Playability	95%
Graphics	100%
Value For Money	100%

Awarded ★★★★★ (Top Rating)"
... HOME COMPUTING WEEKLY

All games are compatible with the BBC B, B+ and Master series computers.

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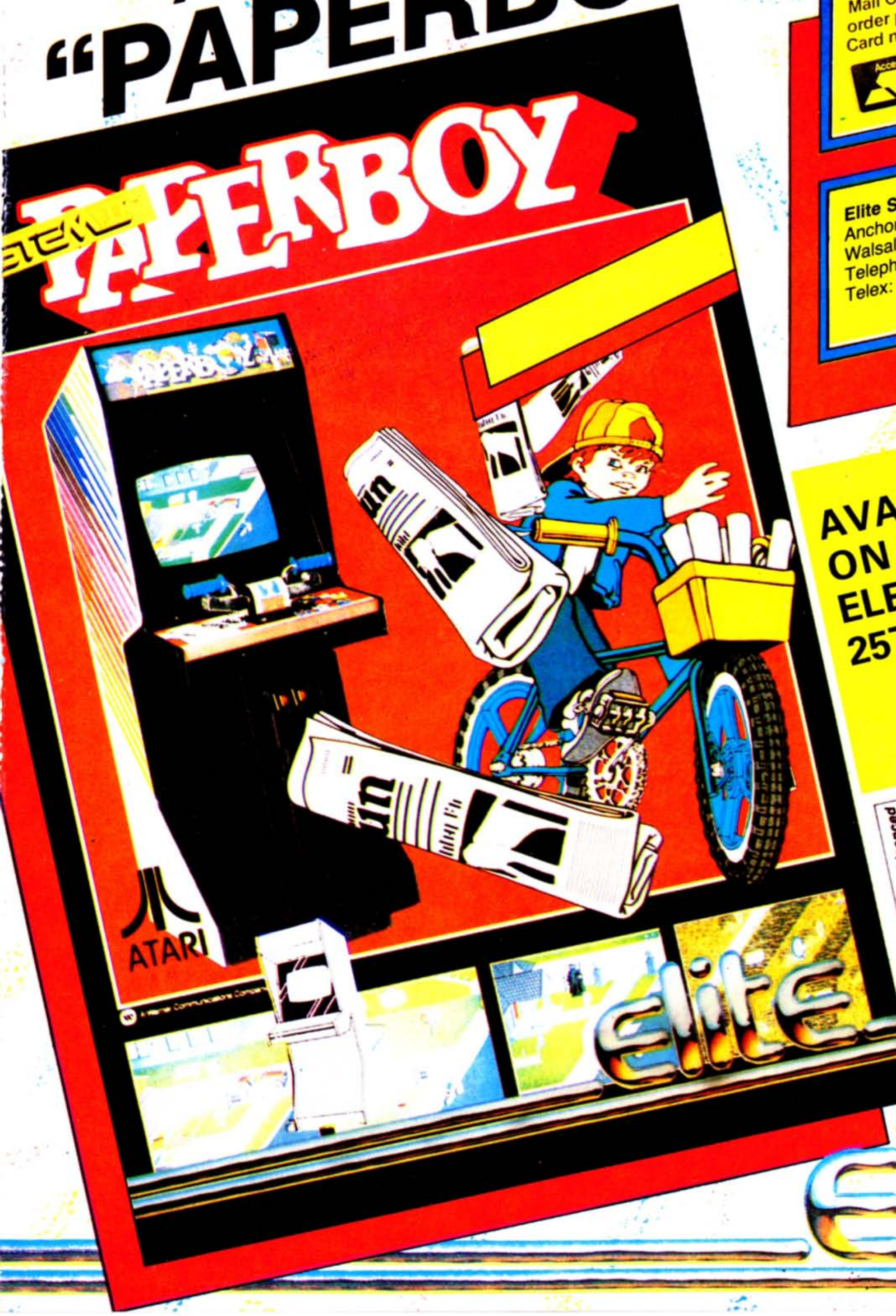

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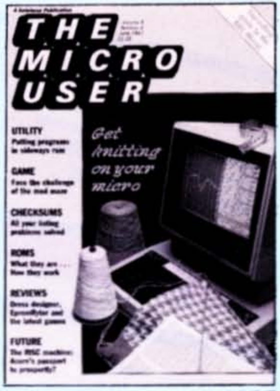
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ABC 59,727
Jan-June 1986

The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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THE MICRO USER takes a sideways look at ROMS

This month we give you lots of details about roms: What they are, how they are made and how to write to them. Plus complete listings of two rom-based utilities.

We've also included a full guide to the currently available rom software.

All these features are indicated in the contents list with:

We've also sent Mike Cook to Acorn to get a run-down on the revolutionary RISC chip. You'll be reading lots more about this exciting development in future issues of *The Micro User*.

NEXT MONTH

New Series
Programming Adventures in Basic

Utility
More memory with sideways ram arrays

Diamond Quest
Colourful fast action maze game

Reviews
Cholo – The new mega game, Quest Mouse, Arthur and more...

THE MICRO USER

July
issue
on sale
June 3

Actual BBC Screen Shot

Something strange has been happening, something unnatural. At first no one took much notice, those who'd experienced it were considered crackpots by those who hadn't. But now people are noticing, the so called 'crackpots' now outnumber the disbelievers.
And so the scene is set. As a Professor of Astro-Physics with more than a passing interest in Psychic Phenomena you are well prepared for the situation. Equipped with your experimental nuclear accelerator you must destroy all the Ghosts, Monsters and Transporters (large, evil looking apparitions) that live in the four buildings that you have been asked to visit.
This brilliant game is one of the new breed of Arcade games, of the style that have rocked the Charts and the Arcades in recent months.
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ALPHATRON
Your mission is to protect the Trilithium Refineries on the Planet Karthos. Pilot a Megan Class Scout Ship equipped with a Delta Laser, avoiding enemy attacks.

RIG ATTACK
Rig Attack is an action packed game with scrolling screens demanding skill and quick reflexes to guide your helicopter from rig to rig whilst avoiding attack from enemy submarines.

VINDALOO
A humerous Arcade Adventure game involving Raj an Indian Take Away owner having eaten one too many hot currys, he must find his W.C. in one of his many rooms in the cellars.

MICRO VALUE

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THE MICRO USER
June
1987

NEWS

LONG LOOK AT CLONES

A WARM welcome has been extended by Acorn boss Brian Long to the new IBM PS/2 range.

The reason for this is that he believes it will help to clear up a "perception problem" plaguing prospective micro purchasers.

"IBM's new machine is a boon in that it will show that MSdos, rather than being a standard, is just a passing phase", he told *The Micro User*.

"So all the nonsense about the need for PC compatibility goes out of the window".

The Acorn managing director insists that he prefers to leave the business of cloning to people like Amstrad's Alan Sugar.

"What Sugar sells must essentially be at the end of its life", says Brian Long, "and that's not our sort of business".

Acorn leaps ahead with 32 bit micros

ACORN is poised to make a sensational entry into the 32 bit market by snatching the lead from mighty IBM.

It currently has under wraps a family of new super-fast machines, the first of which is scheduled for imminent launch.

And that almost certainly means it will be available before the new IBM PS/2, which is unlikely to go on sale before the end of the year.

Though Acorn is unwilling to provide any details of the machines as yet, *The Micro User* has learned that they will be seven times faster than any micro currently available.

In fact they will be able to outperform the BBC Micro by a speed ratio of 70 to one.

The reason for this is that they are based on the revolutionary RISC chip developed by Acorn boffins – the latest version of which performs at 14 mips (million instructions per second). Observers believe if Acorn can come up with competitive price tags for the new range – one unconfirmed report suggests the low level machine will be less than £1,000 – the fortunes of the company will be transformed.

After all, having made the corporate decision to leapfrog the 16 bit generation, the company has had its fair share of problems in recent times.

"The intervening period has been difficult", admits Brian Long, Acorn's managing director.

"While everyone else was into 16 bit, we were still trying to get the most out of our 8 bit machines.

"However now we have taken the leap into 32 bit, we will be ahead of everybody – Atari, Commodore, and even IBM because they will be delivering after us.

"Our new machines will appear and achieve volume sales during 1987".

- *What RISC is all about: See Page 60.*

THE impending entry by Acorn into the 32 bit market has been spotted in Silicon Valley. Denise Caruso, computer columnist on the influential San Francisco Examiner, already predicts great things for the new machines.

She writes: "If the company does indeed come out with a lickety-spit workstation for the education market, the kind of speed it's pumping out beats the pants off anyone using, say, the Motorola 68020 chip for a similar high end education machine".

OEM Boom

OEM is going to take up an ever increasing share of Acorn's business over the next few years.

Currently accounting for around 15 per cent of its turnover, this is expected to rise to in excess of 25 per cent by the end of 1988.

More modes

MULTIMODE, from Malcolm Girling in Cambridge (0223-460356) extends the number of screen modes from eight to more than 100, giving up to eight times magnification.

The package may be used to list files, edit programs and run user-written software. Many commercial programs can be modified to make use of the new modes.

Multimode is available on 40-track and 80-track disc and cassette for £10.50.

New aid for the blind

BLIND and other visually-handicapped people are catered for on the BBC by two new packages. Dotmaster has been developed for the transcription of text into Braille on a BBC Micro or Master.

Dr Ian Kemp of Cardiff University (0222 874000 Ext 5798) explained that because of the complexity of the Braille system blind people can face very long delays in obtaining material.

"Only a limited range of publications which sighted people take for granted are available in Braille", he said.

"Most Braille readers have to rely on the services of voluntary organisations, prisons and religious groups for transcriptions".

Dotmaster can use text files from a number of word processing packages and is compatible with a range of Braille printers.

A feature of the package is an on-screen editor which displays the text and the Braille simultaneously.

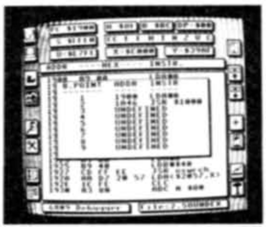
The rest of the package is an intelligent rule-based system which any operator can use to produce very high quality Braille from ordinary typed text.

The complete system costs £200. Interfaces to word processors and printers cost £100. The screen editor is sold separately for education training at £100.

6809
ghost - pc

The most advanced 16/8 bit processor, the 6809 running at 2 MHz, is now available as a Second Processor for the BBC Micro using DMA to access the 64K RAM and allowing true MULTI-PROCESSING.

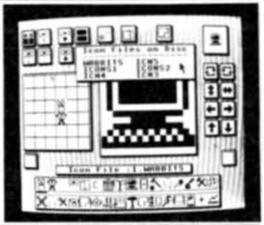
Included with the Processor Card is a DIGIMOUSE to operate the Graphics Operating System (GHOST - with over 100 functions), a Small-C compiler (2.2) and an Assembler.

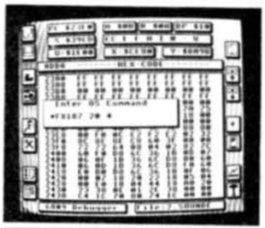


THE 6809/SMALL C

The 6809 has two 8 bit accumulators, combinable for 16 bit arithmetic, and four 16 bit index registers, two of which can also double as the SYSTEM and USER stack pointers. There are over 1450 instructions spanning 17 addressing modes. Instructions include MULTIPLY and provision for Position Independent Code.

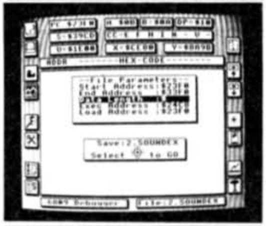
The Small-C compiler is a large subset of the K & R C compiler and produces pure machine code which is VERY fast (Compiled code executes a standard benchmark: tak (18, 12, 6) faster than any other language available on BBC B, including 6502 and Z80 Second Processors). Also included is a text editor, for entry of C and Assembly programs, although other word processors can be used.

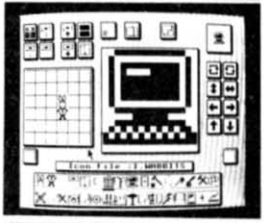




GHOST

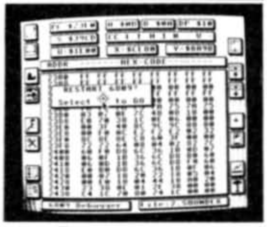
GHOST is a WIMP based Operating System for a PARALLEL PROCESSING environment, allowing the 6809 complete access to the standard BBC OS calls. The average time for the BBC to read data from the 6809's memory is 2 micro seconds, transparent to the operation of the 6809. All the WIMP facilities are directly usable from your own programs, and an ICON DEFINER is included to this end.

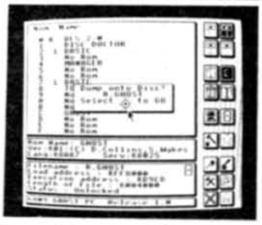




DISC FRONT END

The DISC FRONT END allows the user extended access to the DFS facilities. The disc catalogue may be displayed, and from here files can be selected for execution, compilation or assembly. Also any number of files can be marked for copying or deletion etc. The ROM MANAGER is also selected from this page, as is returning to BBC BASIC.





GHOST DEBUGGER

The DEBUGGER is a full 6809 machine code monitor, allowing memory editing, disassembly, single step execution and breakpointing of 6809 code, as well as saving/loading of memory to/from disc, memory search etc.

A MUST FOR THE ADVANCED BBC USER

The system runs on a Model B with OS 1.2 and connects to the 1MHz Bus and User Port (DIGIMOUSE), and is compatible with Solidisk SWR. There are also two flyleads and the card fits under the lid of the BBC. GHOST comes on 2x16K Eproms. Also supplied, are software disks (40/80T please specify) and Quick Reference Guides. The interactive manual is supplied on disk (UN•X style) and may be selectively printed on to the screen or printer. 6809 and C examples are also included.

— —

Post to: **SOLID STATE LEISURE, 80 FINEDON ROAD, IRTHLINGBOROUGH, NORTHANTS NN9 5TZ. Tel. No. (0933) 650520**

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NEWS

Acorn pushes its Domesday System

ACORN is stepping up its publicity for the Domesday System in an attempt to create a high level of business demand for the £4,000 package.

The company has organised a series of dealer seminars and is offering a number of packages to back up the campaign.

These include a finance plan to help with demonstrations and stock funding and what is described as an unprecedented level of marketing support.

An Acorn spokesman said the campaign was aimed at 300,000 potential business customers. Extensive training facilities were being offered to help dealers demonstrate and sell the product effectively.

The company believes there is enormous potential in the number of applications and users for the system.

These would include banks and finance houses, local and central government departments, transport and construction, oil companies and the energy industry, accountants and architects, consumer goods manufacturers, shipping research agencies, retail chains, holiday and tour operators and major national services.

"The system represents astonishing value, especially when its cost is compared with that of trying to gain similar information by other means", says Acorn.

The Domesday System is the result of a £10 million development programme between Acorn, the BBC and Philips Electronics.

It is based on the BBC Advanced Interactive Video system and two laser discs.

The National Disc has text and pictures on a wide range of subjects including a substantial video record of Britain in the 1980s.

The Community Disc has about 23,500 photographs, 10,000 sets of statistical data, representative contemporary articles and reports, more than 2,000 text items and specially commissioned essays and 60 minutes of video sequences.

It uses Ordnance Survey maps to organise its information. The user moves from map to map and at each level, text and photographs are instantly available, including satellite views of the larger areas.

Business dealers and Acorn personnel at the first Domesday business dealer seminar in London

£5 million goes on research

ACORN spent £5 million on research and development for the year ending December, 1986.

Most is believed to have been allocated to development of the soon to be released RISC machines.

The expenditure is revealed in the company's annual report which also showed that after two years of troubled trading Acorn has bounced back into the black with an operating profit of £1.4 million.

This was on a turnover of £46.7 million for the full year, with the second half of the year up 38 per cent on the first six months.

However Acorn's chairman Bruno Soggiu warned against relaxing in the light of the improved results. "This does not mean there is room for complacency", he said. "The purpose of the investment in new and innovative technology is secure longterm profitability.

"With the launch later this year of the first of our own products based on our new 32 bit RISC microprocessor we are creating opportunities which we intend to exploit profitably for years to come".

Add-on video

A PLUG-in-and-go interactive videotape add-on for the BBC Micro and Master has been launched. The VP170 Video Presenter package is made up of a video processor, a modified Sony video recorder and a rom.

The distributors, Interactive Media Resources (0902-341854) says the sub £1,000 package "amounts to a fast, accurate, yet inexpensive videotape system.

Existing videotapes can be used without any special editing, marking or re-recording, and the recorder can be used in the conventional way.

The rom gives simple star commands to control all video recorder functions. Since the video control software is all rom based, it releases more memory for user programs.

HELP ON SCREEN

A RANGE of on-screen help material for BBC computer owners from beginners to machine code programmers and users of Wordwise Plus has been produced by Micro Help computer services.

More than 100 screens are available, and the software is written in such a way that the user gains access to a menu, from which 15 screens of Help material can then be obtained, with one command.

There is no interference with other programs in the rom format, and the disc system uses only 1k of memory for the code and menu.

Rom versions of the programs Wordwise Companion, Basic Companion, Programmers Companion and Machine Code Companion cost £19.95 each from Micro Help (0686 27549).

Disc versions of Basic Companion, Programmers Companion and Machine Code Companion cost £9.95 each. A compilation of all three on one disc costs £19.95.

Apocalypse now . . .

NEW company Command Software (01-364 0123) has released an updated version of Apocalypse for the BBC Micro.

Up to 16 players can take part in the strategic wargame, calling on armies, navies and nuclear weapons to expand and defend a Power Centre.

A comprehensive manual is included with the program. Price £9.95 on tape, £14.95 on disc.

NEWS

Next in line..

CEEFAX has singled out *The Micro User* for special treatment in the Paper Round section of its electronic computer magazine Next during June and July.

It is the first time a major national computer publication has been featured in this way on Next, which has been running for a year on BBC 2 Ceefax page 701.

Computer writer Keith Hazelton will be devoting his regular look at the micro media on Paper Round to describing how a typical issue of *The Micro User* is written, edited and produced.

The two part feature will be broadcast in the weeks starting June 5 and July 3.

ASL signs Scott

AN exclusive contract with top BBC programmer Peter Scott has been signed by software house ASL.

This follows the recent signing of Gary Partis. Now, all future Peter Scott programs will be available through ASL.

Survey winners

THERE was a tremendous response to our survey in the March issue, and these are the lucky 10 names which were pulled from the sack:

The Opus Challenger disc drive system and a copy of Instant Mini Office goes to John Brownrigg, Liverpool.

The nine runners-up will each receive an Instant Mini Office package: B. Mace, Earley; A. Taylor, Swindon; I. Covey, Petworth; D.L. Bergg, Southampton; G. Kent, Chalfont St. Peter; A.R. Tipper, Exeter; I.H. Smith, Stafford; R. Hume, Biggar; P. Davy, Wakefield.

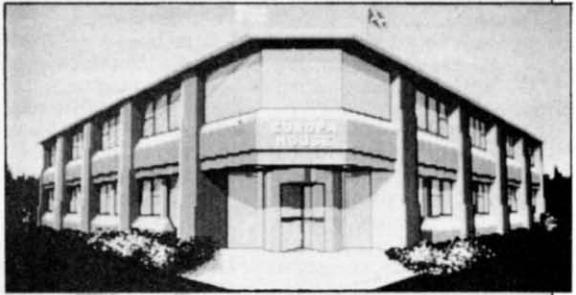
Derek Meakin and 149 fellow diggers attack the green field site of the new HQ.

New home for The Micro User

THE world's first mass sod-cutting ceremony heralded the start of building a new £1 million home for *The Micro User* and its sister Database Publications magazines.

All 150 employees took part in the traditional act of groundbreaking to celebrate their role in the company's rise to prominence in computer magazine publishing.

The new site in the Cheshire countryside near Stockport echoed to the sound of scores of spades and shovels hitting the ground simultaneously at a signal from Database head Derek Meakin. He said: "We originally toyed with the idea of inviting a leading figure from the computer industry to perform the ceremony but decided instead to keep it within the company. All our employees have contributed to Database becoming the UK's leading publisher of computer magazines, so they all deserved to play a part on the big day".



Digitised impression of the new building

BACH AND THE BEEB

WHENEVER Dr Bruce Goatley needs to learn a new piece of music he turns to a very special teacher – his BBC Micro.

As a tenor in the choir of the famous All Souls, Langham Place in London, he must perform a number of important concerts each year. Many of which are broadcast.

Anxious to perfect his part for each occasion, he was delighted to discover that his BBC Micro could help him.

"I bought the Island Logic Music System and started by putting on Bach organ sonatas to impress my friends. Then I discovered how flexible it could be", he said.

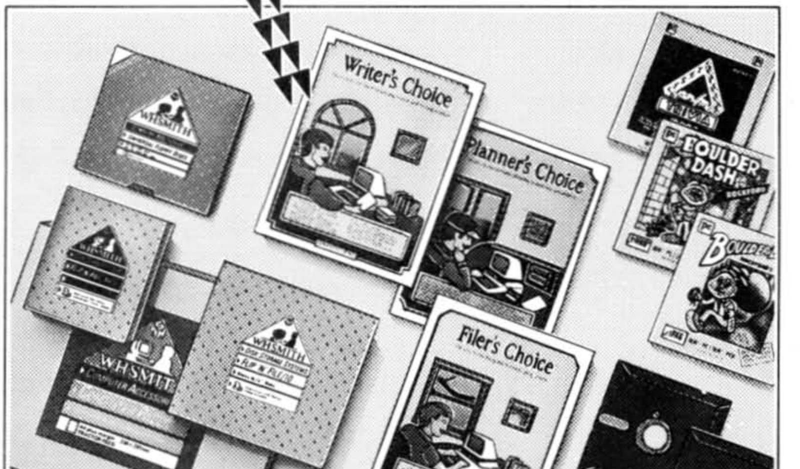
"Because I am not tremendously sure of my sight reading, I decided to put the difficult bits of the music we were going to sing on the computer".

The value of this is that Dr Goatley can make the computer play back the music with his part louder than the rest, thus making it easier to pick out.

"When you listen to a recording of the work all the parts are virtually the same volume. And if you are doing new works then you just have to put in the music and it will sound as it should", he said.

Dr Goatley

Business with pleasure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W.H. Smith now have a range of computer software, plus an extensive selection of computer stationery.

WHS Continuous A4 paper – 500 sheets (letter quality) £6.95.

WHS Pack of 10 x 5¼" universal disks £14.95.

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Business Packages

Writer's Choice (Word Processing) £34.99.

Planner's Choice (Spreadsheet) £34.99.

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PC Games

AM/FM Trivia £9.95.

Boulderdash £9.95.

Boulderdash 2 £9.95.

WHSMITH WHSMITH

Subject to availability. Prices correct at time of going to press.

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One hundred powerful commands covering :

BASIC	Fast line delete - Merge files - String search/replace
DUTILS	Protected disk backup - Sector load/save - Search disk
ADFS	Directory tree display - Date stamp - ADFS format
FILE	Scramble files - Recall last sixty commands - ROM save/load
MEMORY	Memory disassembler - Search memory (across the TUBE)
OPER	ROM management - decrease machine speed - inverse video

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Command parameters may be separated with either spaces or commas

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NEWS

SOFTWARE WINNERS

WINNERS of the two latest Superior Software competitions were BBC Micro users Tony Murray of Ashbourn, Co. Meath, and A.P. Ranson of Swansea.

For solving all 72 levels of Thrust and obtaining the passwords, Mr Murray won a cup and cheque for £200.

Mr Ranson won a cup, a pair of mobile transceivers and £100 for his all correct quiz entry and suggestions for new applications for Speech synthesiser software.

BBC Micro users can now learn all about 68000 chip programming "at home". Flight Electronics (0703 229041) has produced a link to the machine from its microprocessor trainer FLT-68k via the serial port.

This enables users to learn 68000 programming within a familiar environment. The high speed in-line assembler and debugging facilities are easily accessed by the BBC Micro. The computer and monitor act as a terminal and control console. A printer can be attached.

The trainer costs £395, the BBC assembler package £56 – including a 16k eprom – and the cable £13.50. BBC B users will also need a terminal emulator rom costing £30.

Farm package sold

FARM management consultancy Dixon & Dixon has purchased the rights to the Acornsoft Farming Package from Rural Planning Services.

Father and son partners Tom and Alan Dixon are reissuing the BBC Micro programs in conjunction with their own Milkfile package.

Farmcash, for farm accounting and book keeping costs £200, Farmplanner for farm budgeting and business planning costs £180, Fieldfile, for maintaining field records and monitoring crop performances, costs £150, and Capcost for help with capital investments and equipment selection, costs £100.

All four programs are available in one package from Dixon & Dixon (091 2853042) for £500.

Milkfile which monitors production, margins, fertility, feeding and land use costs £200.

It includes identity and health records, milk prices, relative feed values, grass/forage utilisation, projected yields and extensive reports.

THE GALLUP CHART TOP 20

BBC SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	PRICE
1	▲2	RAVENSKULL *(Superior)*	9.95
2	•	SUPERIOR COLLECTION 1 *(Superior)*	9.95
3	▲8	BIG KO *(Tynesoft)*	7.95
4	•	SUPERIOR COLLECTION 2 *(Superior)*	5.95
5	▼1	REPTON 3 *(Superior)*	5.95
6	▼5	MICROPOWER MAGIC *(Micropower)*	7.95
7	▼4	WINTER OLYMPICS *(Tynesoft)*	7.95
8	▼3	STRYKER'S RUN *(Superior)*	9.95
9	▼6	COMMONWEALTH GAMES *(Tynesoft)*	6.95
10	▲12	MINI OFFICE II *(Database)*	14.95
11	▲14	THUNDERSTRUCK 2 *(Audiogenic)*	7.95
12	▼7	SENTINEL *(Firebird)*	9.95
13	▼9	COMPUTER HITS 10 *(Beau Jolly)*	9.95
14	•	DUNJUNZ *(Bugbyte)*	2.99
15	▼11	TRIVIAL PURSUIT *(Domark)*	14.95
16	◀16	DODGY GEEZERS *(Melbourne House)*	8.95
17	▲18	COLOSSUS 4 CHESS *(CDS)*	9.95
18	▼17	CRYSTAL CASTLES *(US Gold)*	9.99
19	▼15	KANE *(Mastertronic)*	1.99
20	•	ELITE *(Superior)*	12.95

Compiled by Gallup/Microscope

This month sees the introduction of the Gallup chart to keep you up-to-date with which software is selling the best. Interestingly Superior Software has six titles in the Top 20 – five in the Top 10. Mini Office II is the only non-game title to feature.

MORLEY ELECTRONICS

TELETEXT

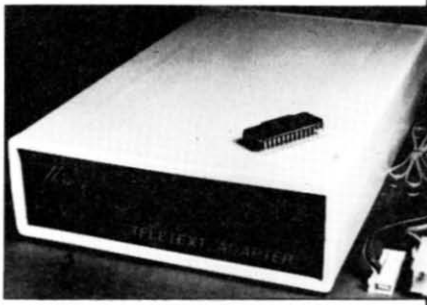
– NOW WITH ATS (Advanced Teletext System) SOFTWARE

The Morley Teletext adapter introduces you to the world of Teletext at a price that wont break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than eight years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a unit that automatically tunes itself in to the required station (no more messing around with screwdrivers in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

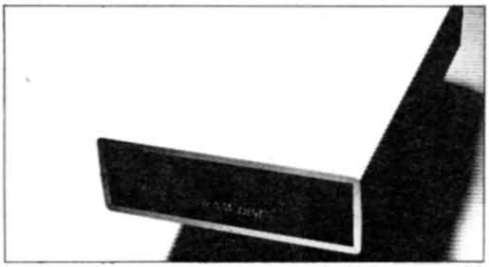
For technical details please ring Morley Electronics on Tyneside (091) 262 7507 after 4.00pm

FEATURES

- Advanced design uses the latest technology will handle ANY future enhancements to the Teletext system eg: full field: 8 bit data transfer: 2k pages etc.
- Simply plugs into the user port.
- Low power consumption, less than 200ma. Optional power supply available.
- User friendly menu driven software including extended OSCLI and Osword commands for access from BASIC programs.
- 16K Support Rom allowing extended commands including printer dumps etc. included in package
- FREE Telesoftware, no access charges. (at present updated weekly.)
- Save selected pages to disc/tape for later retrieval.
- Full access to all Teletext services and channels eg: CEEFAX, ORACLE, 4-TEL.
- Gives you a real-time clock at your disposal (*TIME).
- Free software upgrades to allow for any enhancements to the teletext service. Eg: extra channels, full field data on cable & satellite systems etc.
- Easy to follow comprehensive user guide.
- No hardware limitations, it can for example receive virtually unlimited numbers of channels.
- Works with Solidisc SWR.



- Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).



Now available the first true MEGA capacity RAMdisc for the BBC or MASTER computers.
This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, battery backup and a comprehensive user guide, add to this our usual 12 months no quibble guarantee and we're sure you'll agree Morley have done it again.

FEATURES

1 Megabyte of RAM connected to the 1 MHz bus.
Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase in speed, for example, a 20K mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc.
The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system.
Therefore ensures compatibility with any Acorn compatible DFS (not ADFS).
The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive no. is 4.
'Dangerous' * commands such as *COMPACT, *COPY, *BACKUP etc are intercepted and the BBC's RAM from page 2 to &7FFF is saved to RAMdisc workspace, and may be recovered using a * command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The save operation delays the * command by just under 0.4 seconds. The BBC's RAM can also be saved by an interrupt-driven routine which can be enabled by a * command.
The 'filing system wedge' ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter, verifier and 'sector' editor for use with the RAMdisc.
Catalogue structure allows up to 2,709 files.

EPROM PROGRAMMER now available programs 8, 16 and 32k EPROMS connects to the user port software available on rom or disc.
Now programs new generation CMOS Eproms.
Deluxe cased with ZIF socket.

DESFAX 7 – Now you can run your own TELETEXT service! Incorporates the powerful editing facilities of DESIGN 7, again with Teletext adapter interfacing.
Stores up to 100 of your screen designs on a 40Tk disc or 200 on an 80Tk. Page selection by 3-digit number HOLD, REVEAL, page linking, individual page delays etc.
PLUS – a powerful CAROUSEL facility permits continuous slide-shows. Only one disc access for every 16 screens – reduces wear on drives. Smooth animation, variable speed text printing, built in printer dumps. Sample data disc and 22 page manual included. Beats all other systems for ease of use and versatility.

M/B software DESIGN 7

Easily the best value Mode 7 screen designer on the market today. Design any mode 7 screen, from simple MENU pages to full CEEFAX standard. This program is an invaluable aid. Designs can be saved to disc as automatically numbered files or the program will convert the screen into a Basic Proc.
INTERFACES DIRECTLY WITH ADAPTER allowing CEEFAX-ORACLE pages to be selected and dropped into editor screen for alteration, saving, or conversion to BASIC. Allows channel change from within program.

M/B software MASTER COPY

. . . the selective copier **you** need for the BBC MASTER computer . . .
Dramatically reduces the time taken to copy unprotected discs,
DFS to ADFS, ADFS to DFS, DFS to DFS, ADFS to ADFS
using one or two, single-ro double-sided drives.
An 84K RAM buffer enables many files to be copied in one pass with the minimum of disc swapping, and directories are created automatically as required. Files of any length are handled.
Supplied on disc, MASTERcopy runs form sideways RAM and is invoked with a * command. The program re-installs itself in sideways RAM when copying is done, ready for later use.
The ROM image supplied can be used to blow your own EPROM too, for use in the MASTER's cartridge slots.
Typical time to copy all 31 files DFS to ADFS is under 2 minutes!
£12.95 on disc – £14.95 for ROM version (including postage etc.)

For further details on all products call 091 262 7507 after 4.00pm

To order please fill in and send order form to: **MORLEY ELECTRONICS, Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne and Wear NE28 6BY.**

Adaptor Software
ROM ☐
SWR DISC ☐
40 TRK ☐
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Qty. ☐ Master Copy Disc	@ £11.95 inc. VAT
Qty. ☐ M/B DESIGN7 screen designer	@ £7.95 inc. VAT
Qty. ☐ Teletext utilities on Disc	@ £5.95 inc. VAT

Qty. ☐ Optional PSU	@ £9.95 inc. VAT
Qty. ☐ 1 Mbyte RAM disc	@ £199.95 inc. VAT
Qty. ☐ 2 Mbyte RAM disc	@ £349.95 inc. VAT
Qty. ☐ Eprom Programmer V.2	@ £27.95 inc. VAT
Qty. ☐ Desfax	@ £23.00 inc. VAT

MU/5

Total £

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You ain't seen (or heard) nothing yet!

The critics raved about the Music 5000 synthesizer—a major advance on the Music 500. Yet the 5000 had its drawbacks:

- ✗ it required both hands on the keyboard
- ✗ no music print out was available
- ✗ only a few bars were visible at any one time
- ✗ the option to design your own waveform was not available
- ✗ it was expensive for what it offered

Now, the new generation is here:

The Music 7000 solves all the old problems and has these new outstanding features:

- ✓ **6502 2nd processor compatible**
- ✓ **Light pen driven**
- ✓ **Mouse driven**
- ✓ **Keyboard available soon**
- ✓ **Easily affordable**
- ✓ **Software available to upgrade your Music 500 or Music 5000 at £39.95**

MUSIC 7000
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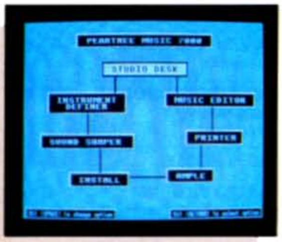
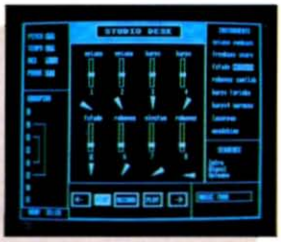
£79.95

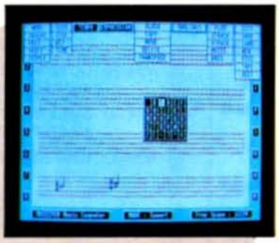
▶ PEP024


PEARTREE MUSIC 7000
STUDIO DESK
INSTRUMENT DEFINER
MUSIC EDITOR
SOUND SHAPER
PRINTER
INSTALL
AMPLE

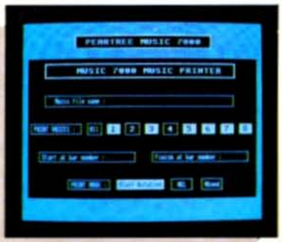
Music 7000 main menu


STUDIO DESK

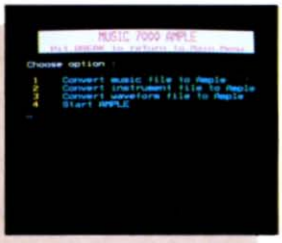
Studio Desk menu with mouse driven record, play, rewind options



Music Editor menu, light pen & mouse driven with complete menu options at top


PEARTREE MUSIC 7000
MUSIC 7000 MUSIC PRINTER

Music Printer menu with many unique features



```
MUSIC 7000 AMPLE

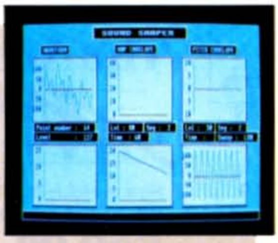
Choose option :

 1    Convert music file to Ample
 2    Convert instrument file to Ample
 3    Convert waveform file to Ample
 4    Start AMPLE
```

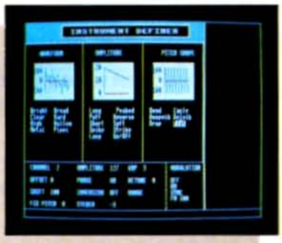
Music 7000 Ample menu

MUSIC 7000 INSTALLATION MODULE

Music 7000 Installation menu allowing you to install your mouse, keyboard, light pen, printer type, colours, etc.


SOUND SHAPER

Sound Shaper allowing you to create your own waveforms, envelopes, mouse, lightpen or keyboard driven


INSTRUMENT DEFINER

Instrument definer allows you to define your own instrument pitch, amplitude and wave forms

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All prices are exclusive of VAT.

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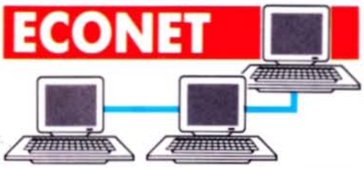

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The Acorn Music 500
SYNTHESISER

Now available from **Peartree** the Acorn Music 500 for the BBC, BBC B+, Master 128

£49.00 excluding VAT.

only from PEARTREE ▶ **ACH034**

COMPONENTS

ACP007	**EPROM 27256 32K** 32K eprom	**£4.95**
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ACP033	**BBC MASTER DUST COVER**	**£4.50**
ACP034	**BBC B DUST COVER**	**£4.50**
ACP035	**BBC MASTER COMPACT DUST COVER**	**£8.50**

MODEMS

ACS075	COMMSTAR II Now compatible with Master 128	**£29.95**
ACP014	**PACE NIGHTINGALE** 1200/75 75/1200 300/300 baud rates BT approved complete with cables Includes Comstar II	**£99.00**
ACP015	**PACE NIGHTINGALE COMBO** As above with Comstar software	**£129.00**
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SOFTWARE

Computer Concepts

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SOFTWARE

Computer Concepts

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ACS033	**SPELLMASTER**	£51.55

ACORNSOFT

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ACS022	**TERMULATOR** Terminal emulator enables the host computer to be sent directly to the BBC's output driver	£29.00
ACS023	**COMAL** Programming language standard in many European countries	£39.00
ACS024	**BASIC EDITOR** Powerful screen basic editor	£25.00
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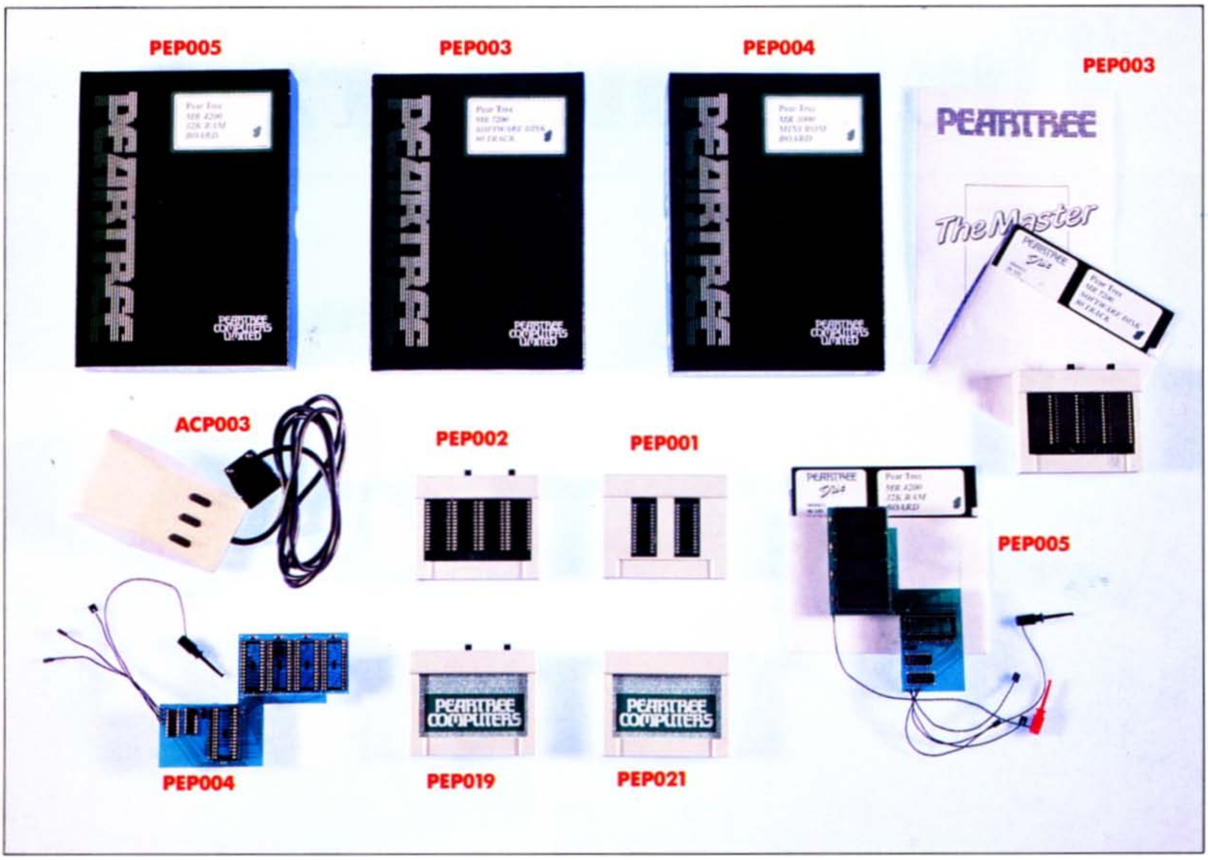

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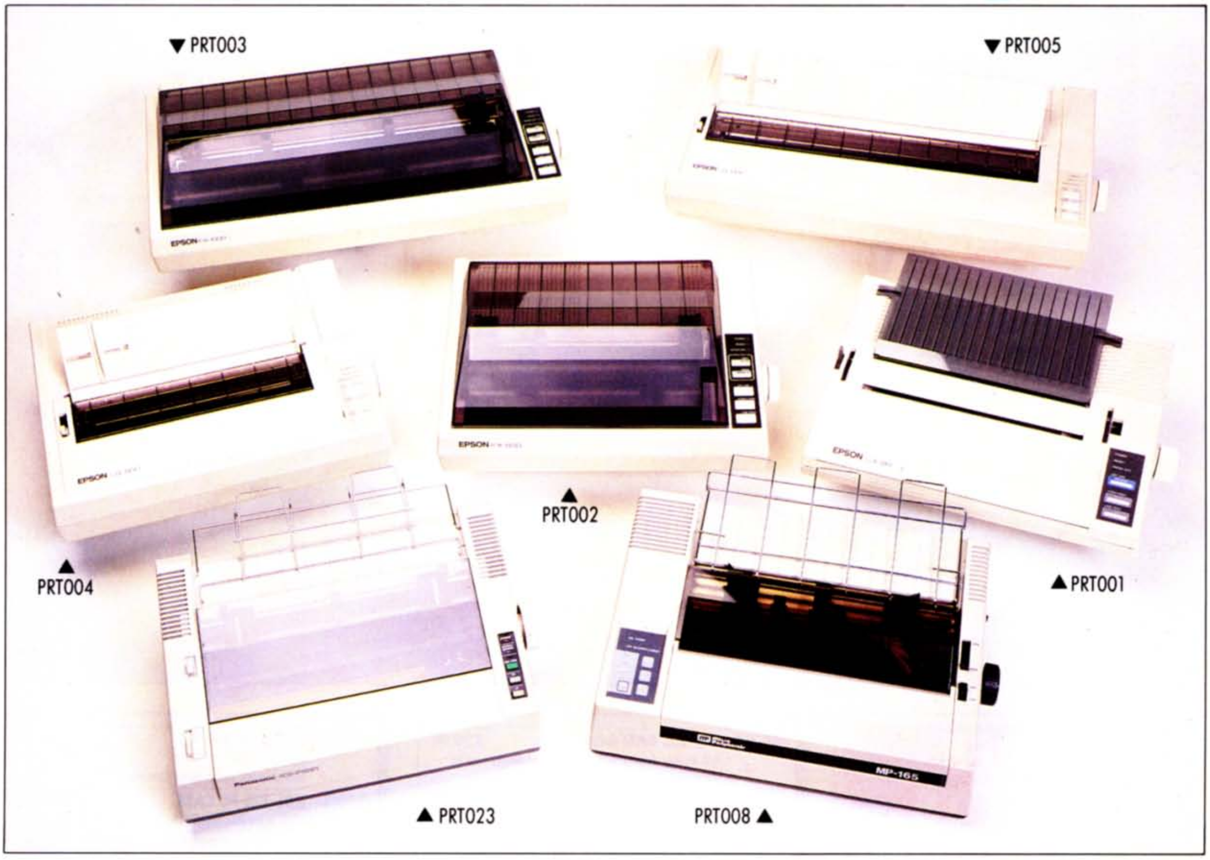
The Printers Page



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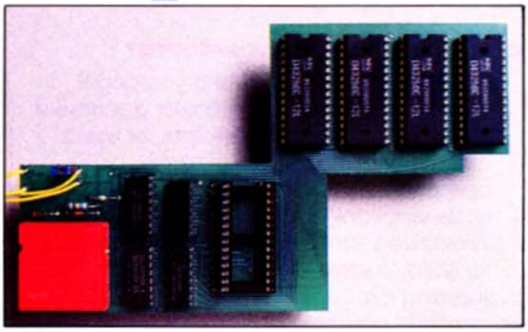

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Sideset

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THE WINDOWED TASK-SWITCHING SYSTEM FOR THE BBC MICROCOMPUTER

- **What is windowed task-switching?**

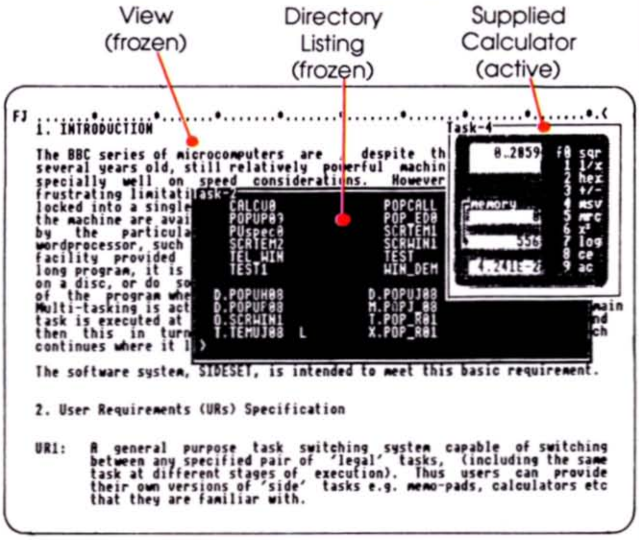
How often have you wished you could see the contents of a particular document while word-processing another, or use a calculator in the middle of some operation, or observe a running program while simultaneously viewing its listing? Windowed Task-Switching gives you these facilities. In essence it is the ability to suspend the current program, start or continue another and then when desired, resume the original program from where you left off.

Sideset enhances the BBC Micro by providing this facility (and more!) within a windowed environment. For example, go from running BASIC in one window to PASCAL in another to BCPL in yet another!

- **What is Sideset compatible with?**

Virtually everything! – from serious applications/languages eg. VIEW, BCPL, BBC Basic etc. to utilities eg. ADT, ADE etc. to games eg SNAPPER, ARCADIANS etc. In normal use Sideset is totally transparent, controlling each task within its own window via simple key sequences. (Tasks can of course take over the whole screen, after which the windowing effect will temporarily be lost).

Sideset also includes a set of a quick response utilities to aid everyday use of your BBC micro eg: **calculator, scratchpad & diary interactive help facility etc.**



```
FJ .......•.......•.......•.......•.......•.......•.......•.......•.......•.(
   1. INTRODUCTION                                              Task-4
   The BBC series of microcomputers are   despite th        0.2859  f0 sqr
   several years old, still relatively powerful machin              1 1/x
   specially well on speed considerations.  However                 2 hex
   frustrating limitatiTask-2                                       3 +/-
   locked into a single    CALCU0              POPCALL    memory    4 msv
   the machine are avai    POPUP07             POP_ED0              5 mrc
   by   the   particula    PUspec0             SCRTEM1              6 x²
   wordprocessor, such     SCRTEM2             SCRWIN1         556  7 log
   facility  provided      TEL_WIN             TEST                 8 ce
   long program, it is     TEST1               WIN_DEM    4.241E-2  9 ac
   on a disc, or do  so
   of  the  program whe  D.POPUH08           D.POPUJ08
   Multi-tasking is act  D.POPUF08           M.POPJ_08                 main
   task is executed at   O.SCRWIN1           T.POP_R01                 nd
   then  this  in  turn  T.TEMUJ08  L        X.POP_R01                 ch
   continues where it l>
   The software system, SIDESET, is intended to meet this basic requirement.

   2. User Requirements (URs) Specification

   UR1:   A general purpose task switching system capable of switching
          between any specified pair of 'legal' tasks, (including the same
          task at different stages of execution). Thus users can provide
          their own versions of 'side' tasks e.g. memo-pads, calculators etc
          that they are familiar with.
```

The features of Sideset include:

- No special hardware required – just a plug-in single chip memory module
- Real task-switching with Nested windows – in all screen modes!
- Ability to save a task and its environment onto a disk *indefinitely and re-activate days later!
- Bundled utilities
- Easy replacement of the supplied utilities with those of your own – written in any language!

*Sideset requires a disk filing system (DFS, ADFS etc)

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MU01

SEE AND TRY AT THE MICRO USER SHOW (8-10th MAY)

✓ Get it right!

Steve Turnbull shows how to ensure your typing is error-free

TYPING in programs from magazine listings can be a heartbreaking affair. You sit there for hours pecking away with one or two fingers, hunting for keys, losing your place in the program or finding you've typed the same thing twice.

And then you run it, only to find that your typing errors swarm like flies in the listing, and every time you get one sorted out a dozen more bugs creep out of the chips.

So you go over it and over it, enlisting someone to read out the listing character by character – or as one enterprising person did, get your speech chip to read it – while you doublecheck.

And then you try to run it again – and still it doesn't work. Is there a solution? There is. It's called a Checksum.

A checksum is a number calculated from a block of data, then compared with a number previously calculated from the same block of data. If the numbers are the same, you can be fairly sure the block of data is correct; if they are different then the block of data is now in error.

For example, given a DATA statement in a program listing:

```
50 DATA 35,23,77,245
```

the program writer knows this data is correct and so creates a checksum by adding the data items together and adding the result to the end of the line:

```
50 DATA 35,23,77,245,380
```

This data could be in a program with a checking routine to ensure that the number at the end of the data line is the same as the number calculated by adding the first four data items together:

```
  10 REM Program I
  20 READ A%,B%,C%,D%,check%
  30 sum%=A%+B%+C%+D%
  40 IF sum%=check% PRINT"Okay" ELSE
PRINT"Error"
  50 END
  60 DATA 35,23,77,245,380
```

Listing I: Simple checksum demo

You can try changing the data items and seeing what happens to the result. This system in various forms has been used by many of the writers for *The Micro User*. Unfortunately, it suffers from various problems. If you change line 60 to:

```
60 DATA 23,35,77,245,380
```

there is no error message, because two data items are swapped and they cancel each other out.

This particular problem can be avoided by making the checksum position-dependent. That means that even if two values cancel each other on simple addition the error can be detected by taking their position into account:

```
30 sum%=A%*1+B%*2+C%*3+D%*4
60 DATA 35,23,.7,245,1292
```

Now even if two items are swapped over the error is still detected. The disadvantage of this sort of position modifier is that big numbers are generated very quickly.

When this simple checksum technique is applied to machine code (with or without the position modifier) secondary errors can be generated. This makes the whole program look wrong even when only one typing error has been made.

The only way to be sure that each line of a program has been typed in correctly is to have an individual checksum on each Basic line. This ensures that every line containing an error is marked, and avoids secondary errors because the Basic assembly code is checked rather than the assembled code itself.

The most common error checking method in the BBC Micro is the Cyclic Redundancy Check which is used by all filing systems to ensure that data has not been corrupted.

The cassette system is very fond of the Data? error which is caused when the CRC calculated for a newly-loaded data block does not match the CRC stored at the end of the block.

Creating a CRC involves a fairly complex calculation, but the result is both position dependent and very sensitive to the slightest error. Table I shows two series of eight bytes which differ in only one place, and next to each is the cumulative CRC which shows how dramatic the change is when the difference is met.

Series	CRC	Series	CRC
X	DBFD	X	DBFD
X	5CEB	X	5CEB
X	AB84	X	AB84
X	5B7C	X	5B7C
0	2EB5	X	4C63
X	AB51	X	31B5
X	8E7C	X	488F
X	D7BB	X	9D31

Table I: Comparison of CRCs

Program II gives the short Basic program that generates the checksums. Loaded and run at PAGE=&7000 it

Turn to Page 24 ▶

◀ *From Page 23*

scans a Basic program located at the normal page setting. Obviously we can't print the checksums for the checksum program because you won't be able to check it.

You may have noticed that rather than having just a simple four-digit hex number as the checksum there is also a fifth digit set off to the right. The four-digit group applies only to the current line but the extra digit is calculated on a cumulative basis.

This means that by finding where the last digit produced from your program differs from the last digit in the list in the magazine you can spot the first error in your typing. Otherwise you would have to compare every single checksum to find the error.

Certain conditions are taken into account when calculating the checksum. Spaces at the beginning and end of lines are not included in the CRC, but if there are any extra spaces at the end of the line an asterisk is added to the checksum to mark it.

Any lines which are empty, have only spaces, or have just a REMark are ignored and are given a CRC of zero. Machine code comments are also ignored.

So there it is, a program that will ensure that every program you type in from the magazine can be correct – just as long as all the checksums match.

How to use the Checksum program

Before you start typing in a listing load the checksum program like this:

```
PAGE=&7000
LOAD"B.Chksum"
```

Then set up function key zero with:

```
*key0PAGE=&7000|MOLD|MRUN|MPAGE=&xxxx|M
```

where xxxx *is your usual page setting. Now press Break.*

Type in five to ten lines of the listing from the magazine and press function key zero. You will then get a list of checksums like those shown in the picture.

Compare the checksums produced by your micro with those printed in the magazine. If the single digit is correct for the last two lines then you can be 99.9 per cent sure the whole program is right so far.

If they are not the same, start at the beginning of the checksum lists and compare until you find the first difference, then check the four digit checksums in that area until you find the odd one out.

When you've found the different checksum examine that line of listing until you spot the difference. The main errors to watch out for are extra or missing spaces, characters swapped round and upper/lower case differences.

Listing II: Basic checksum program

```
100 REM **********************
110 REM *   Basic Checksum   *
120 REM *  by Steve Turnbull *
130 REM * (c) The Micro User *
140 REM **********************
150 MODE7
160 PR)Cinit
170 PRINT
180 PROCcheck
190 VDU15
200 @%=&0090A
210 END
230 DEF PROCinit
240 A%=131
250 B%=(USR(&FFF4)AND&FFFF00)DIV256
260 Z%=0:M%=0
270 DIM code 50
280 workcrc=&80
290 PROCassem
300 @%=&00904
310 PRINT"Checksums to printer (y/n)?
320 P%=FNyesno
330 IF P% THEN ENDPROC
340 PRINT"Page the screen (y/n)?";
350 IF FNyesno THEN VDU14
360 ENDPROC
380 DEF FNyesno
390 REPEAT G%=GET AND &DF
400 UNTIL G%=ASC"Y" OR G%=ASC"N"
410 =(G%=ASC"Y")
430 DEF PROCcheck
440 IF B%?1>&7F ENDPROC
450 REPEAT Q%=0:C%=0
460 IF B%?0<>&0D PRINT"Bad Program":EN
ROC
470 N%=B%?1*256+B%?2
480 K%=B%?3:J%=4
490 PROCps
500 IF L%>4 PROCsp:PROCsc
510 IF P% THEN VDU2
520 PRINTN%" = ";
530 PRINT~C%" ";~Z%AND15;
540 IF K%<>L% PRINT"*" ELSE PRINT
550 IF P% THEN VDU3
560 B%=B%+K%:UNTIL B%?1>&7F
570 ENDPROC
590 DEF PROCps
600 L%=K%
610 REPEAT L%=L%-1
620 UNTIL B%?L%<>32
630 L%=L%+1:ENDPROC
650 DEF PROCsp
660 IF B%?J%<>&20 ENDPROC
670 REPEAT J%=J%+1
680 UNTIL B%?J%<>&20 OR J%=L%
690 ENDPROC
710 DEF PROCsc
720 IF J%=L% ENDPROC
730 REPEAT PROCb(B%?J%)
740 J%=J%+1:UNTIL J%>=L%
750 ENDPROC
770 DEF PROCb(G%)
780 IF G%=&2A Q%=NOTQ%
790 IF M% PROCmc ELSE PROCbs
800 IF J%=L% ENDPROC
810 C%=FNc(C%,G%)
820 Z%=FNc(Z%,G%)
830 ENDPROC
850 DEF PROCmc
860 IF Q% ENDPROC
870 IF G%=&5C PROCm
880 IF G%=&5D M%=FALSE
890 ENDPROC
910 DEF PROCm
920 LOCAL Q%
930 REPEAT
940 J%=J%+1
 950 G%=B%?J%
 960 IF G%=&22 Q%=NOTQ%
 970 UNTIL J%=L%OR(G%=ASC":"AND NOTQ%)
 980 ENDPROC
1000 DEF PROCbs
1010 IF Q% ENDPROC
1020 IF G%=&F4 J%=L%
1030 IF G%=&5B M%=TRUE
1040 ENDPROC
1060 DEF FNc(X%,A%):Y%=X%DIV256
1070 =USR(do_crc)AND&FFFF
1090 DEF PROCassem
1100 FOR L%=0 TO 2 STEP 2
1110 P%=code:[OPT L%
1120 .do_crc
1130  STX workcrc
1140  STY workcrc+1
1150  EOR workcrc+1
1160  STA workcrc+1
1170  LDX #7
1180 .crc_lp
1190  BIT workcrc+1
1200  CLC
1210  BPL crc_skp
1220  LDA workcrc
1230  EOR #&10
1240  STA workcrc
1250  LDA workcrc+1
1260  EOR #&08
1270  STA workcrc+1
1280  SEC
1290 .crc_skp
1300  ROL workcrc
1310  ROL workcrc+1
1320  DEX
1330  BPL crc_lp
1340  LDA workcrc
1350  LDX workcrc+1
1360  RTS
1370 ]:NEXT
1380 ENDPROC
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

This listing is included in this month's tape & disc offer. See order form on Page 167.

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Solidisk Technology

SOLIDISK MASTE

If you want to upgrade your BBC B to a Master, why not use our MASTERPLAN? We buy in your Beeb and sell you a brand new MASTER: you pay only the difference.
Fill in the blanks below to help you cost the project:

Acorn Master 128K, brand new cost 499.00

BBC Model B, issue ...., trade-in worth ☐
(issue 2 = £131, 3 = £191, 4 = £187, 7 = £225)
DFS, memory and other add-ons, trade-in ☐
(We accept only Solidisk and Acorn add-ons
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Masterising

If you are not yet ready to upgrade to a Master, why not Masterise? All you have to do is add Shadow Ram, Sideways Ram, the Real Time Clock and ADFS disk filing system — all available from Solidisk at good prices. You do not have to purchase them all of course, and they will not turn your Beeb into a Master (no numeric keypad or Rom slot, for example), but all the essential features are there and the solution could be well worth your while.

Real time Clock, Yes: £29, No: nil ☐

1770-DDFS plus ADFS, Yes: £55, No: nil ☐

DFDC plus ADFS, Yes: £60.00, No: nil ☐

(Twomeg) 128K RAM, Yes: £60.00, No: nil ☐
(other options include Twomeg 32,
Twomeg 256, Fourmeg 32 and Fourmeg 256)
Total cost of MASTERISING project ☐

Solidisk Real Time Clock:

The Real Time Clock and Calendar (RTC) can be plugged into any ROM socket on the Beeb with absolutely no other connection to make. It is powered by a rechargeable NICAD battery which should keep the RTC active throughout the Summer holidays.
Star commands include: Alarm, Bell, Boot, Configure, Dalarm, Noclock, Roms, RTC, Settime, Show, Status, Time and Unplug. FX161 and 162, Osword 14 and 15 are similar to the Master 128. It is also compatible with Basic 4's TIME$.
The RTC has many of the autoconfigure features of the MASTER with the same command syntax: Caps/Nocaps, data, delay, Fdrive, File, Ignore, Lang, Loud/Quiet, Mode (0-135), Boot/Noboot, Dir/Nodir, Time/Notime, Printer, Repeat, Rx, Scroll, Tube, Tv, Tx. If your Beeb has an AMX mouse, the RTC offers a DESKTOP and a CALCULATOR, just like GEM!

Order as RTC *£29.00*

Solidisk Dual Density Disc Systems:

Solidisk offers two types of disk filing system, with a choice of two Rom types. Both are based on the Western Digital WD1770 chip — the standard not only for the BBC model B, but also the BBC +, Master, Compact and ADFS. Both are fully compatible with Acorn Roms, offering complete solutions to the problems of updating the BBC, based on 1770, 8271, DFS and ADFS systems.
Not only is our range therefore unequalled, but also the features it offers; if you don't believe us, check other makes before you buy.

Which DFS?

WD-1770 DDFS Disk Interface:

If your Beeb has not yet been upgraded to disc, then the DDFS is the right choice. It is certainly the most popular version on the Beeb and easy to fit. Use with Acorn or Solidisk Roms to give compatibility with any 40/80 track drive, with or without PSU.

New, low price without Rom	*£35.00*
With STL 2.2 ROM (see below)	*£45.00*
With STL 2.1 ROMs (see below)	*£55.00*

BEEB Model B

WD-1770+8271 DFDC Disk Interface:

If you already have an 8271 based DFS from Acorn, Watford Electronics, Pace, Cumana or Viglen, this is the only way to add the WD-1770 to your system. Fully compatible with the Acorn DNFS1.20 ROM for the 8271 and Acorn ADFS for the 1770. Allows the Acorn chip set to self-erase, keeping memory requirements (and PAGE) at a minimum. For maximum performance, use the STL 2.2 Rom (for both 8271 and 1770). If ADFS is required, use Acorn DNFS1.20 ROM (for your 8271) with the STL 2.1 Romset (for the WD-1770). The last combination will still allow self erasure, and will add single and double density, cross format file copy, ADFS as well as NFS. In other words, everything imaginable with the Beeb.

New low cost DFDC without Rom	*£40.00*
DFDC with STL 2.2 Rom	*£50.00*
Special offers:	
DFDC with STL ADFS 2.1 Romset (see below)	*£55.00*
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1770
SOLIDISK dfdc
8271

Which ROMs from Solidisk?

STL DFS 2.2 ROM:

Runs with both 8271 and WD-1770 chips from Acorn, Watford and Opus, and 1770 from STL, and offers the following features:
★ 40/80 track software switching ★ unlimited catalogue entries ★ automatic Read after Write for media security ★ runs with Z80, 6502 and Econet ★ more commands than any other DFS including FORMAT in 40/80 track, VERIFY, DZAP, MZAP, RECOVER, RESTORE, WORD, RTRACK, WTRACK, DSTEP, ETC ★ when used with the WD-1770, reads disks in single and double density and IBM format ★ 60 per cent free extra storage space in double density (640K per disk compared with Acorn's 400K) ★ more speed and bigger file size.
Supplied on one 16K Rom with manual

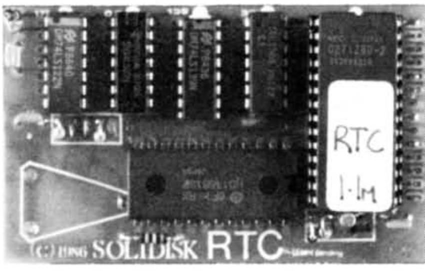
Order as the DFSR2 .... *£20.00*

PLEASE SPECIFY WE/OPUS/MASTER/COMPACT as applicable.

The ADFS 2.1 ROMSET:

This double ROM set has all the commands of the STL DFS 2.2. Rom but runs ony with the 1770, not the 8271 system. It has many more besides, including all the commands in the Acorn ADFS Rom.
PLUS: ADFS disk formatter (for 40, 80 and 160 tracks) and VERIFY ★ MVADFS and MVDFS to transfer cross format disks between DFS and ADFS with automatic PAUSE for disk change when using a single drive ★ user specified (1 to 10) number of file channels to keep PAGE to a minimum ★ runs with the Z80, Turbo, 32016 and the new 80186 PC compatible upgrade.
Supplied on two 16K Roms or one 32K with two user manuals
Order as ADFSROM 2.1 .... *£30.00*

PLEASE SPECIFY WE/OPUS/MASTER/COMPACT/16K OR 32K as applicable.



Real Time Clock

Solidisk FD35 3.5″ Disc Drive:

This is a superb 80 track, double sided, dual density drive, also useable on the ATARI ST. You get up to 640K maximum per disc (800K with the 80186) and at its price, you are guaranteed of extremely good value. Comes with demo disk.

Order as FD35, single drive	*£100.00*
Order as TFD35, twin drive	*£200.00*
Order as ADFS16 for the Compact	*£113.85*
Separate PSU if required (PSU/35)	*£25.00*

Recommended media:
Sony Double Sided, double density, 135 TPI or equivalent (£29 per box of 10).

Solidisk FD525 5.25″ Disc Drive:

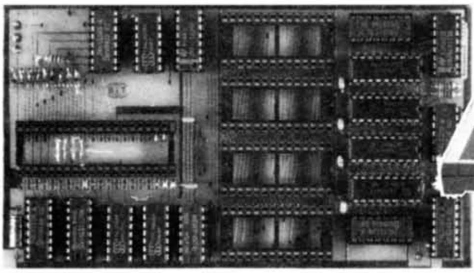
This is a superb 80 track, double sided, dual density drive and very fast. You get up to 640K maximum per disc (800K with the 80186 board), 40/80 manual switch is optional as most Acorn DFS ROMs and Solidisk's have automatic 40/80 track software switch.

Order as DF525, single	*£119.00*
Order as TFD525, twin in a bridge	*£228.00*
Orders as TFD525/CPU, twin in the CPU case with detachable keyboard case for Beeb	*£239.00*
Separate PSU if required (PSU/525)	*£25.00*
40/80 track manual switch optional	*£2.00*

PLEASE SPECIFY SWITCH/MASTER/COMPACT/ ELECTRON if applicable.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

RISE YOUR BEEB!



TWOMEG 128

New: The Twomeg 128K board

Solidisk has always been closest to emulate the MASTER 128K. The Twomeg 128K features 64K of Sideways RAM in four banks: 4, 5, 6 and 7, selected by a single latch at &FE30 for both read and write exactly like the Master. The remaining 64K is more versatile and can be used as four more Sideways RAM (12, 13, 14 and 15) or as Shadow RAM and a 24K printer buffer (good news for wordprocessor users).

The new Twomeg 128K will run Computer Concepts Interword, Sheet and Spellmaster, Acorn View 3.1, Viewsheet, Viewstore, Basic etc.
A clever switch write-protects only the 8 banks of Sideways RAM without affecting the Shadow RAM and the Printer Buffer.
Ramdisk is not forgotten, you can have one in ADFS (if you have Solidisk ADFS) or in DFS for both 8271 and 1770 disc controllers.
Four extra ROM sockets are available directly on the Twomeg 128K board, numbered 8, 9, 10 and 11. Four ROM sockets on the Beeb are renumbered to 0, 1, 2 and 3.
Software is supplied on FIVE discs, containing Wordprocessor, Spelling Checker, Database, Macro Basic, Ramdisk, Menu, Manager etc. Software Pack 2 (five discs) is optional and contains many useful utilities for the machine code programmer. Software Pack 3 also optional, contains around 50 of Solidisk Megagames. List of all programs in these software packs is included in the Twomeg 128K User Manual.
Fitting is extremely easy: just plug in the board into the CPU socket and push 3 terminals onto S20, S21 and S22. Internal logic produces chip select for the &FE30 latch. Free installation by local experts is available.

Order as 2MEG128	£60.00

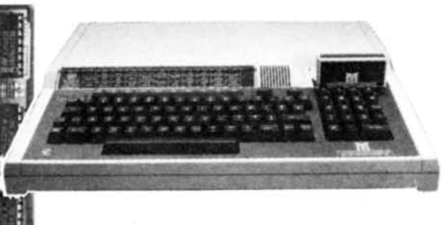
PLEASE SPECIFY /40 TRACK OR /80 TRACK FOR THE SOFTWARE PACK 1, included in the price.

Optional software Pack 2 or 3 (five discs)	£10.00

Detachable Keyboard and CPU case:

This 'three box' casing system will help you to organise your desk and improve comfort. The keyboard features the lowest profile (maximum height of any key is 47mm) and does not skid. Typing angle is 2-3 degrees better. The monitor sits on top of the computer. Pure metal construction provides EMF shielding against phantom keyboard interrupt and accelerates heat dissipation (no messy metal strengthening over plastic). Keyboard lead is 24" long.

Order as K/CPU case, special offer price while stocks last	£25.00
Note:	
Post and packing	£6.00



MASTER 128

The Fourmeg 32K board:

The Fourmeg 32 is a ROM expansion board on its own with up to 224K of installable firmware. It also is the FASTEST shadow RAM board around (it runs at 4 MHz while others run at 2 MHz, including the MASTER), and the fastest Sideways RAM board. It consumes also less power than any other ROM RAM board through the extensive use of CMOS devices.
The top row of five ROM sockets will take software ROMs, up to 32K each, such as used on the Beeb Plus, the MASTER or the Compact. They are high speed sockets.
The middle row contains 40K of high speed CMOS static RAM chips, acting as a Shadow RAM and a printer buffer or as two banks of Sideways RAM. Write-protection of Sideways RAM is performed by separate Read and Write registers with automatic write-protect when one presses the BREAK key.
The CPU is a 4 MHz, CMOS technology, GTE 65C02, similar to the one on the Turbo board, replacing the existing 6502.
The Fourmeg 32K is also upgradable, once more by the latest CMOS technology: 62256, 32k RAM on a single chip which plugs into one of the high speed ROM sockets.

This board is designed such that one can have everything required on a single, compact and easy to install unit. All the necessary software is in a MANAGER ROM (supplied). Star commands include: Shadow, Ramdisk, Ramoff, Ramdfs, Ramadfs, Ramdrive, Testram, Plus. A complete toolkit to assist programming in Basic is also included: Hardbreak, Join, Keyload, Keysave, Kill, Lvar, Menu, Msearch, Mzap, Page, Printer, Rcat, Number, Report, Rload, Rwipe, Salvage, Status, Sound. One year guarantee.

Order as FOURMEG 32	£70.00
Additional 32K chip (optional)	£15.00
Software packs 1 to 3 (optional), each of five disc	£10.00

The Fourmeg 256K board:

The Solidisk Fourmeg 256 board combines high CPU speed (4MHz GTE 65C02) with large memor size (256K Dynamic RAM, 8K static RAM) and powerful supporting software (32K MANAGER ROM). It offers four ROM sockets featuring high speed and high capacity (up to 64K ROM per socket), 8 shadow RAM banks, 8 Sideways RAM banks or even both.

Order as Fourmeg 256K	£135.00

NOTE: NO MORE ROM BOARD TRADE-IN IS ALLOWED AFTER 1ST MAY 87.

Wordwise Plus or Interword Special Deal:

If you buy Wordwise Plus or Interword together with a Twomeg or a Fourmeg board, you get extra special discount!

Wordwise Plus (bundle only)	£30.00
Interword (bundle only)	£50.00

Solidisk Technology

Special Offers on Sideways RAM boards:

These exceedingly popular systems (40,000 plus units sold) enables the Beeb users to load ROM images into the Beeb, make a 16K printer buffer, use DFS with PAGE at &E00, play Solidisk Megagames, bigger Basic (Vstore), store music and inumerable other uses as supported by a library of 15 software diskettes.
They consist of a base unit plugging into the rightmost ROM socket on the Beeb and an exchangeable RAM card with capacity ranging from 32K (two Sideways RAM banks) to 128K (8 Sideways RAM banks). They are now made available to you at less than half their normal price, all offering extremely good value. One year guarantee, supplied with User Manual and one software disc.

SWR32, 32K RAM, disc No 1	£20.00
SWR64, 64K ROM and two 16/32K ROM sockets, Disc NoI	£30.00
96K Extension for SWR 32	£25.00
SWR128 (new style), 128K RAM, two 16/32 ROM sockets	£45.00
Software Packs 1 to 3, each of five discs, any pack	£10.00
Any disc volume 1 to 15 each	£2.00

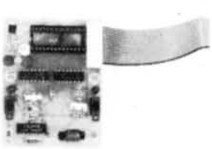
PLEASE SPECIFY /40 TRACK OR /80 TRACK as applicable.

Electron Disc Interface:	£50.00
BABT approved Modem plus Linemaster ROM	£30.00

EPROM Programmer:

The UVIPROM is the cheapest Eprom programmer on the market yet the easiest to use, will program 2764 EPROMS in one minute and 27128 in two minutes.
A different version called the UVIPROM32 will program 27256 EPROMS in 4 minutes.
The MULTIPROM is the Deluxe version, combining the capacity of the UVIPROM and the UVIPROM32 and some other features. Use it to program 2764, 27128 (normal and A type), 27256 (12.5V and 21V), 27512, 27513 etc. Textool 28 pin ZIP socket fitted as standard.

UVIPROM plus disc No 10	£20.00
UVIPROM32 plus disc No 10	£20.00
MULTIPROM plus disc No 10	£44.50
UVIPAC Eprom Eraser	£20.00
2764 EPROM each £2.00, ten for	£16.00
27128 EPROM each £4.00, ten for	£34.00
27256 EPROM each £7.00, ten for	£63.00
Panasonic KX-P1081 Special Offer:	£149.00 + VAT



IMPORTANT NOTICE: TRADE-UP

Solidisk will accept return of memory boards up to ONE YEAR old for TRADING-UP. The selling price (below) is the price we sell the same goods at the time of the trade-up transaction.

Age	**Trade-up allowance**
Up to 3 months	90% of selling price
Up to 6 months	85% of selling price
Up to 9 months	80% of selling price
Up to 12 months	75% of selling price

If the balance of the upgrade is less than £15, a minimum charge of 15 is made.

****
As a result of our MASTERPLAN, we have a number of BBC Model B's for sale every day. All are fully inspected, reconditioned if necessary, and guaranteed. All have a new DDFS fitted as standard. We also buy second-hand Beeb for cash. See our price list for details.
****

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

NEW BRANCH IN BRISTOL OFFICIAL DEALER IN AVON

System One

System One: COMPACT now with 5.25" drives:

The System One consists of a Master Compact 128K, twin disc drives, optional monochrome or colour monitor, optional printer. Solidisk will give you free our own CDFS 2.1 ROM, a Dual Density Beeb Disc Filing System featuring disc sector editor (for both DFS and ADFS discs), MVDFS and MVADFS for cross format file transfer, disc formatter and verifier etc. Some of the options include 5.25" drive(s) which we believe is a better choice than the 3.5" format. The 5.25" format is still preferred for the Master 128 (even now, with 80186 board) and on the Beeb. Cheap discs, better reliability, better software availability are some of the key advantages. Don't buy single drive systems because you can't make copy ADFS discs with a single drive.

Available options (all prices include VAT):

A — Compact 128K with Acorn 14" Colour monitor, CDFS, twin 3.5" drive, one demo disc containing Solidisk Database, Spelling Checker and Megagames (as illustrated):	*£749.00*
B — as above but with one 3.5" drive and one 3.5" drive and one 5.25" drive:	*£748.00*
C — as above but with twin 5.25" drives in a bridge unit:	*£759.00*

Monochrome Option:

All systems above (A, B or C) can be supplied with Acorn 12" monochrome monitor in place of the Colour monitor:-

A	*£598.00*
B	*£597.00*
C	*£608.00*

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SPECIFICATIONS

Print Method	Impact Dot Matrix
Print Speed (cps)	Draft 120 NLQ 24 Compressed 102
Print Mode Selector	Standard/Program, Near letter quality, Compressed
Print Direction	Bi-directional with logic seeking (Uni-directional in bit image mode)
Print Head	9 pin
Print Head Life	100 million characters
Line Spacing	⅛", ⅙", 7/72", n/72", n/216" (programmable)
Line Feed Speed	100 ms (per ⅙")
Character Set	Full 96 ASCII characters with descenders, Italic, 32 International characters (11 Countries), IBM* special characters, IBM block graphics
Character Structure	HOR × VERT
Draft	9 × 9
NLQ	18 × 18
Block graphics	6 × 12
Bit Images (Dots/inch)	60, 72, 80, 90, 120, 240 (120 can be used in standard or double speed)

Printing Sizes	Characters per inch				Characters per line			
	Pica	Elite	Semi-Comp	Comp	Pica	Elite	Semi-Comp	Comp
Draft/NLQ	10	12	15	17.1	80	96	120	137
Double width	5	6	7.5	8.5	40	48	60	68
Proportional Spacing	Variable				Variable			

Paper Feed	Adjustable rear tractor feed and friction feed
Paper Width	Fanfold paper 3" to 10" Single sheet 4" to 9"
Number of Copies	3 (Original plus 2 non-carbon copies)
Interfaces Standard Optional	 8 bit parallel RS-232C (DTR, X-ON/X-OFF or ETX/ACK — KX-P110, DTR, X-ON/X-OFF — KX-P17)
Buffer Standard Optional	 1 K text buffer 4 K text buffer (KX-P12)
Compatibility	RX-80™, IBM Matrix and Graphics Printers (Elite Pitch command of the Proprinter is also available.)
Noise Level	60 dbA
Reliability	MTBF 4000 hours at 25% duty (not including head life)
Environmental Conditions (Controlled)	Operating: 41°F to 104°F (5°C to 40°C)/20 to 80% humidity Storage: −4°F to 140°F (−20°C to 60°C)/10 to 90% humidity
Power Requirement	240 V AC ± 10% 50 Hz 0.6 AMP
Dimensions (W×D×H)	15.9" (403 mm) × 11.3" (286 mm) × 4.5" (115 mm)
Weight	13.4 lbs. (6.1 kg)
Other Options	Color ribbons: Brown (KX-P111), Blue (KX-P112), Red (KX-P113)

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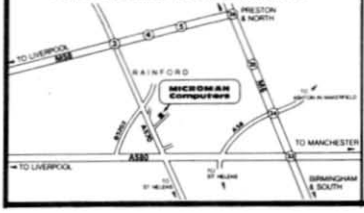

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Firetrack

★★★★★

BY the start of the 22nd century the asteroid belt had been colonized by the pirate industrials. With the breakdown of negotiations between the pirates and Earth, the so-called Pirate Wars began.

Earth's attacks were concentrated on the Firetrack, a central trading route which spans the eight worlds of the asteroid belt. Military intelligence has reported a "white light" opening somewhere on the firetrack.

You must locate this source of limitless power before the pirates do, as failure could result in the destruction of the Earth.

Each world on the firetrack is powered by its own nuclear power plant, disguised as the eyes of the devil rock, located at the end of each colony.

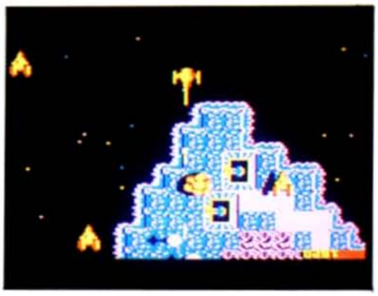
Your mission involves flying over the colony, blasting all ground installations, and finally destroying the nuclear reactor. While the pirates are still reeling from your first attack you strike the colony a second time – kick 'em while they're down!

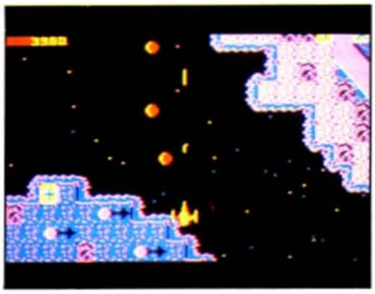
You then take a short trip through commspace and on to the second colony.

Fortunately you don't have to be an arcade ace to sample the delights of several colonies – a choice of three starting positions is possible using the function keys.

By beginning on the third colony you are treated to one of the few abandoned areas of the firetrack. Here you can wreak havoc without facing a constant swarm of pirate ships.

Game controls consist of the four direction keys and fire. As Firetrack is an out-and-out zapping game, the ship fires constantly without your intervention. The fire button is there for those occasions when you are looking for that bit of extra fire power – a kind of turbo boost button.





The game begins as you peel off from the small team of three hatchfighters. All the characters are beautifully detailed with highlights and shadows.

Flying smoothly over a background which scrolls vertically downwards, you notice + and x signs on the landscape. When you finally destroy the reactor a bonus score is calculated on the number of these symbols that you destroyed during the run.

About three quarters of the way through the colony you will encounter the computer base, covered with ? symbols. An extra fighter is awarded if you destroy 10 or more of these symbols – well worth the effort.

Your progress through each colony is hampered by large numbers of pirate ships, which fall into one of five categories. The first group seems to be oblivious of your presence, swirling down the screen following a set pattern.

The second group is similar to the first – but travel in straight lines down the screen. With either of these two types you can shoot or avoid them quite easily, but the third variety of pirate shows a glimmering of intelligence – these chaps drift slowly down the screen, homing in on your present position.

These are best dealt with by remaining stationary at the bottom of the screen, allowing them to bunch together. You can then blast the majority and sidestep any survivors.

One of the nastier varieties of pirate are those which fly down the screen and then dart to the right once they are level with your ship. I had been rammed on numerous occasions before discovering that the pirates couldn't get you if you flew your ship against the left hand side of the screen.

The last class of pirate is indestructible – this category contains one type of ship and the dreaded space mines. Deposited by the enemy craft, the mine drifts slowly across the screen, drastically reducing the space in which you can manoeuvre.

On the higher levels the pirates no longer attack in distinct waves, they begin to overlap. Not only this, the speed at which they travel is absolutely incredible. The best tactic at this stage is to close your eyes, hold down the turbo fire button, and use the force – well it worked for Luke Skywalker!

Firetrack is for the player who thrives on danger, a pilot with nerves of steel and lightning reflexes. Are you brave enough to fly the Firetrack?

Jon Revis

Price: £9.99 (cassette) £14.99 (disc). Supplier: Electric Dreams, Terminus House, Terminus Terrace, Southampton, Hampshire SO1 1FE.
Tel: 0703 229694

Sphere of Destiny

★★★★

THE latest game from Gary Partis, author of such notables as Positron, Psycastria and the vast Dr Who and the Mines of Terror is Sphere of Destiny. The title is perhaps more suited to an adventure, though I assume it derives from the reggae group of the same name.

The idea of the game is simple: Guide a bouncing ball through 60-odd levels of a 3D obstacle course within the allotted time limit. Control is relatively simple – left, right, accelerate, decelerate and jump/bounce.

The action takes place on a five-lane roadway made up of a number of multicoloured tiles, each of which has a different function.

White squares give bonus points, purple ones make you bounce. Green tiles increase your speed but red bring you to a virtual standstill. Beware the cyan tiles – right becomes left, accelerating slows you down and you're soon totally lost.

Owners of the Spectrum, Atari or Amstrad CPC will notice many similarities with Trailblazer from Gremlin Graphics.

Sphere of Destiny is a perfect example of the way delicate little refinements can give a game that subtle feel of something really special.

From the rolling demo and musical accompaniment to the clicking on and off of the keyboard LED as an invitation to enter your name in the high score table, Sphere bombards you with special effects.

I found Sphere, like Gary's other recent games, much too difficult.

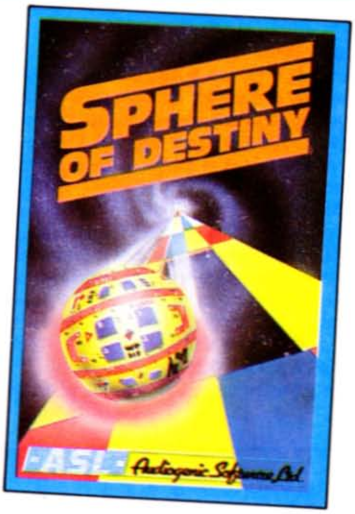
This is a great pity as he's remarkably good at finding that elusive addictive quality. I still regularly go back to Psycastria, but I have rarely completed the first stage. Perhaps Gary should release his games before he's had a chance to get too good at them – it might give us mere mortals a chance.

I found it particularly ironic that the highly amusing scrolling text featured a message of thanks to someone who had helped make the game "more playable". I only made it to level three a couple of times in a few hundred attempts.

Sphere of Destiny is driving me nuts, but I'm sure it'll still be driving me nuts in a year's time.

Hac Man

Price: £7.95 Supplier: Audiogenic, 12 Chiltern Enterprise Centre, Theale, Berks. RG7 4AA. Tel: 0734 303663



★★★★★ Excellent
★★★★ Worth buying
★★★ Only average
★★ Could do better
★ Give it a miss

Grand Prix Construction Set

STRAP yourself into the cockpit of your formula one racing car and prepare to thrash your way around 18 of the world's most tortuous racing circuits. Once you've mastered these you can load up the construction kit and design yourself another set of circuits.

Whether you're loading the game from tape or disc, the construction set is always loaded first. Before getting down to the nitty gritty, you must enter the names of two drivers and specify whether you want to use the keyboard or a joystick.

You are now ready to choose a circuit on which to race, which can be done in one of three ways. The first is to sit down and construct your own, the second is to load a circuit which you designed on a previous occasion, and the last is to race on one of the 18 tracks which Superior have already provided.

For those who want to get straight into the game, the pre-defined circuits are excellent. A diagram of each circuit is called up as you browse through the collection. Once you have found a track that you like, the race section of the program is loaded.

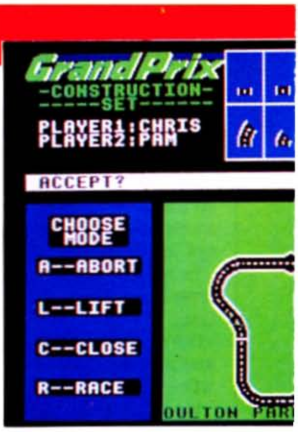
Make quite sure that the track you load is one that will keep you amused for a while – you cannot select another track without re-loading the program.

Constructing your own circuits couldn't be simpler – there are 15 sections of track at your disposal, all of which are displayed at the top of the screen.

Using joystick or keyboard you highlight the piece of track required and the program will tag it on to the last piece you laid. If you make a mistake, just press L and the latest section of track is removed. By repeatedly pressing L you can backtrack all the way to the starting section.

The different pieces of track can be used to create some devilish race circuits. Apart from the straights and bends, there are also short and long chicanes, chicane bends and hump-backed bridges.

Unfortunately some of these features do not appear as you might expect when racing around the circuit. The banked bends are no more raised than any other bends – you are just allowed to take them at a higher speed.



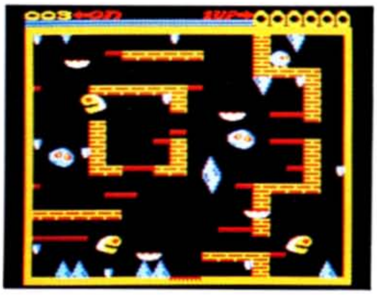
The chicanes do not taper gently, the road changes from full width to half width instantly.

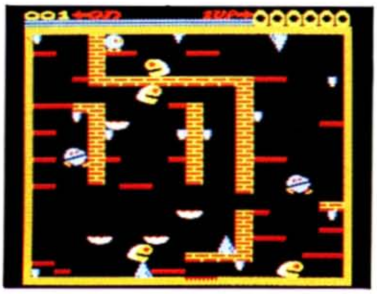
On the positive side, the hump-backed bridges do cause you to rise and fall. Cross a bridge at a speed of greater than 180mph and you'll take off – unfortunately touching down

Price: £9.95 (cassette) £11.95 (5.25in disc) £14.95 (3.5in disc). Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX. Tel: 0532 459453

Hunkidory

★ ★ ★ ★ ★





DAVE the Dungdroid is trapped in the dungeons of the planet Hunkidory. All you have to do is help him battle his way through 20 different levels, back to the planet's surface.

Hunkidory is an early program by the prolific ladders and levels game writer Peter Scott. Unlike Last of the Free, each level consists of a single screen – you do not wander from screen to screen collecting objects.

Before you can proceed to the next level you need to collect all the 10 valves scattered around the screen. As is usual with this type of game, success is dependant upon spotting the correct route as well as split-second timing.

Each screen is constructed from a mixture of walkways, moving platforms and sharp spikes. Whizzing between these structural hazards are numerous alien life-forms – needless to say contact with such creatures is always fatal.

The graphics employed in Hunkidory are dated, the sprites very simple, and the backgrounds crude and boring. They may be a challenge to complete, but they don't have the necessary graphical gloss to make you want to keep trying till you succeed.

One of the most infuriating features of the game is the way that everything is reset when you lose a life. No matter how close you are to completing the screen, you are returned to the starting point and all the valves are replaced.

The controls are a simple – left, right and jump. Stepping from the edge of a platform causes you to fall vertically – however the left and right keys can be used to provide a controlled drift in either direction.

The instructions contain a mysterious message about pressing Control and C to produce strange effects. On one occasion I tried this combination and exterminated the next alien I encountered. When attempting to reproduce this effect I hung the machine. C'est la vie.

The top two lines of the screen are reserved as a status display showing the level number, lives left, time remaining before your present droid expires and your score.

There are options to play with or without music, or run a demo routine which gives you a three second glimpse of every screen you will encounter.

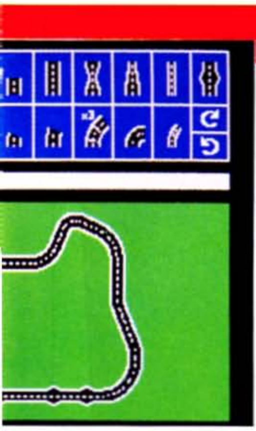
BBC/Electron
HUNKIDORY
BUG-BYTE

Hunkidory is a very average ladders and levels game – you have been warned.

Steve Brook

Price: £2.99 (cassette). Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB. Tel: 01-439 0666

★ ★ ★ ★



again tends to be a messy business.

The final feature of the construction set is the close option: Once your circuit is nearing completion you can press the C key and the computer will then attempt to complete the circuit for you.

At last you are ready to load up the race section of the game. Races are held over one to nine laps, and can take place between two humans, or one human and the computer. The computer is capable of five skill settings: On level one the computer can be beaten easily, on the other four it can't!

The screen is divided into three equal sections. The top display follows the computer-controlled car, the middle one follows your progress, and the bottom one displays two small diagrams of the circuit.

As each vehicle moves round the track its position is logged on the diagram. Frequent reference to this display will help you prepare for sharp bends and hump-backed bridges. By watching your opponent's display, as well as your own, you can spot which side he is about to overtake you on, and block his manoeuvre.

Bumping and barging is accepted practice on the Superior race circuits - on one occasion the computer car and my own became locked together while battling it out down one particularly nasty section of chicane.

The construction kit is excellent, and the race section, while not up to the standard of Revs, has sufficient thrills and spills to keep you on the edge of your seat.

James Riddell

GRAND PRIX
CONSTRUCTION SET
SUPERIOR SOFTWARE
ACORNSOFT
Compatible with the BBC B, B+ and Master Series computers
BBC Micro Cassette £9.95

Imogen

★ ★ ★

MICRO Power has had its share of arcade/adventure games. First there was Castle Quest, followed some time later by the disastrous Dr. Who. Now the company returns with a vengeance – its latest release, Imogen, is an absolute stunner.

This is an arcade/adventure game constructed from 16 separate sections which are stored on cassette or disc and loaded up as required. Using such a technique overcomes all memory limitations, allowing the programmer to create a game of limitless size.

Each section consists of four linked screens which contain a number of puzzles, designed to stop you reaching the spell that is hidden on each level.

There is a password for each section and Micro Power has kindly supplied four in the instructions to help eliminate the problem of becoming stuck on a early level.

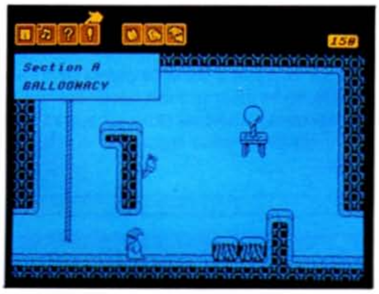
There is a save game option which will save the game to the current filing system – all partially solved puzzles are saved as they are, for your future torment.

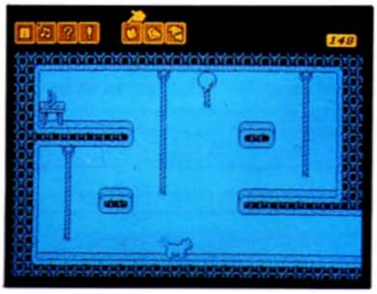
Imogen is a wizard who lost a few of his marbles while battling a dragon. For his own safety, and that of the local community, he was incarcerated in a dungeon by the great wizard. He must earn his freedom by solving the dungeon's many puzzles and collect the 16 pieces of the Spell of Release.

One of Imogen's party pieces is transformation: He can change from wizard, to monkey, to cat at will. Each form has a different ability – the wizard can use objects, the monkey can climb and the cat can jump long distances.

You control Imogen's transformation using a set of icons at the top of the screen.

Price: £8.95 (cassette) £9.95 (5.25in disc) £11.95 (3.5in disc). Supplier: Micro Power, Northwood House, North Street, Leeds LS7 2AA. Tel: 0532 458800





The remaining icons will give you the password for that level, allow you to enter a password, change the screen colours, switch the sound on and off, and save the game.

Each character is beautifully animated using Mode 4 graphics, so the cat, for example, trots briskly across the screen waving its tail. The burning torches which illuminate the rooms are masterpieces of flaming animation.

Level one is entitled Balloonery for reasons which soon become apparent as you try to make your way from the first screen. To your right is a brick wall that is just too high to be jumped. Floating high above you is a small table, suspended in mid-air by a balloon.

Donning monkey guise I scrambled up a nearby rope and attempted a feline leap on to the table hoping to weight it down. Unfortunately it is just a claws length out of reach, and I fell to the floor. (One good thing about the game is the way that you can fall from any height without injury).

The room to the left contains two long ropes dangling from the ceiling, and two short lengths of rope fastened to balloons and floating on the ceiling. The trick here is to climb a long rope, then jump off and grab one of the short pieces. As you float gently earthwards you perform a mid-air leap and clear the high wall to your left.

In this new chamber is a bow, and following more rope climbing you return to your starting point and burst the balloon. Your archery skills are called upon again when some little creep won't let you get to the spell.

Once you have collected the spell you are transported to level two. High above you can see the spell, but your way is barred by an enormous bulldog, lazily chomping on a dish of Kennomeat. Using all the lateral thinking you can muster, you do a little gardening, collect some of a mysterious liquid, and drug the dog – this is not as easy as it sounds.

As my copy of the game was a pre-release demo version, I did not see as many screens as I would have liked. But if the rest are as good as these I will be out there with everybody else, queueing up to buy a copy of Imogen.

An excellent arcade/adventure game is a rare thing – they are usually lacking in either the puzzle or the graphics departments. Imogen is lacking in neither, the puzzles are clever and the graphics are a delight.

Carol Barrow

★★★★★ Excellent
★★★★ Worth buying
★★★ Only average
★★ Could do better
★ Give it a miss

Plan B

★ ★ ★ ★

THE object in Plan B is to guide your little robot on a mission through 54 screens which represent the different rooms of a Togrian Computer Complex, destroying the numerous vital parts of the computer as you go.

The golden rule to observe as you make your way from screen to screen, is that if it moves it must be an enemy, so you should either avoid it or instruct your little robot Rambo to blast it out of existence.

You might think that this is a fairly standard scenario and that there is nothing to set this game apart from at least a dozen or so other games. So let's look at what makes this one so different and so special.

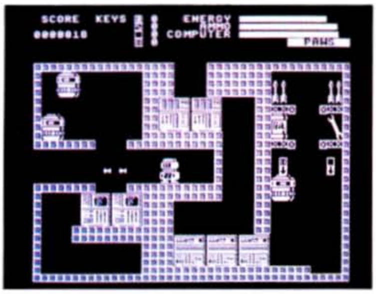
For a start it's a little difficult to classify what type of game it actually is, but I suppose Plan B qualifies as a multi-screen, shoot-em-up, arcade adventure maze game. Although I think this may be an over simplification.

Each screen shows a room with many different puzzles to solve and nasties to blast. The nasties are different types of security guard robots that attack your drone. Each one causes a varying amount of damage, shown as a drain on your energy level.

Another problem is that the security robots are teleported to the current room and the longer you spend there the more robots are beamed in as reinforcements. In fact if you hang around too long in certain rooms they start to resemble Piccadilly Circus in the rush hour.

You are able to fight back but you'll need to top up your ammunition from time to time, when the chance arises. The energy level of your robot can be restored by maintenance, achieved by collecting the spanners and cans of oil you'll find on your travels.

Your passage from room to room is not always as straightforward as it appears. You will need to collect numerous keys and use them to get through locked doors in certain rooms. However, you will soon find that a door will not open if the correct key has not yet been collected.



In addition to the obvious routes through the screens, many of the walls conceal passages which will only be revealed when the wall is shot away. Similarly many of the passages contain barriers which can be destroyed only from a particular position on the screen.

A further complication to those bent on charging through and blasting everything in sight is that stray shots have a nasty habit of always hitting an ammunition dump or oil drum.

While that does not do you any immediate harm it can be very frustrating to battle through a pack of security robots then find yourself without the means to reload.

The game appears to have something for everyone, from those who enjoy painstakingly producing those complicated maps and diagrams, showing us how to get from A to B in the easiest and most efficient manner, to those who just wish to work off a head of steam and spend an hour or so nasty-blasting.

The only minus point is that all the graphics are in black and white, but the quality more than compensates for this. They are extremely detailed and each screen seems to offer another example of superb design which is almost an artform.

BBC/
ELECTRON
PLAN B
BUG-BYTE

Character movement is super-smooth and at times the action is not just fast, it's lightning fast. Sound effects are fairly good. A neat little tune is played between games, although this can be switched off if it becomes annoying.

Movement is with the Z and X keys for left and right with the Shift key producing lift up the screen. It's nice to see the Return key being given a rest and this is only used to open a door.

The nasties are blasted with the spacebar. There is also a pause facility which can be useful to examine a screen without being zapped.

The only criticisms are that you only get one life – you then have to restart – and the lack of colour. But Elite proved it's not essential for a first-class game and that's certainly what you have here and at a bargain price.

Beejay

Price: £2.99. Supplier: Bug-Byte, Victory House, Leicester Place, London WC2H 7NB. Tel: 01-439 0666

Ice Hockey

★ ★ ★

FANCY skimming over the ice and flicking the puck into the opponents net? That's what is on offer in this team game simulation for one or two players from Bug-Byte.

The rules are all well explained on the cassette inlay and the keys you use are displayed on screen at the start of the game. In fact, it's a well-packaged budget-priced offering which claims to be Master 128 compatible.

You start with a face-off in the centre and you can see the central third of the rink. If the puck moves to either end the appropriate third of the pitch is drawn. This is fast and does not interfere with the smoothness of the game. There is a permanent on-screen display of the score and the amount of time played.

Like similar team game simulations, you control just one of the players on the screen, the rest being computer controlled. A nice touch is that the player you are controlling is highlighted by a different coloured shirt.

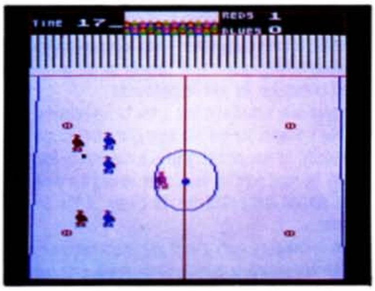
Ice hockey lends itself to being a computer game. It is only six-a-side and has strict rules about player positions, so the number of characters moving on the screen is limited and should make for a fast game. Also, a small puck is used rather than a large ball, which should help with the speed of drawing.

The playing rules are simple, too. There are no throw-ons to cope with as the ball bounces off side walls, and in this well-behaved version there are neither fouls nor sin bins.

The advantages that ice hockey has over football for a computer simulation are well illustrated by this game. The action is fast and smooth with the players really seeming to glide over the ice.

It's easy to give the puck a resounding thwack and see it shoot to the other end of the rink, but deft touches are possible as well.

There is a pleasing tune which can be turned off, but it's a pity that it switches itself back on after every goal. The simple sound effects are well executed and not intrusive, though they can't be turned off.



The graphics are simple and a little chunky but once the game starts you've no time to worry about that. As you would probably expect, it is not easy to beat the computer team, but it is possible.

This is a well-produced and fun game which represents good value for money with its low price tag.

Rog Frost

Price: £2.99. Supplier: Bug-Byte, Liberty House, 222 Regent Street, London W1R 7DB. Tel: 01-439 0666

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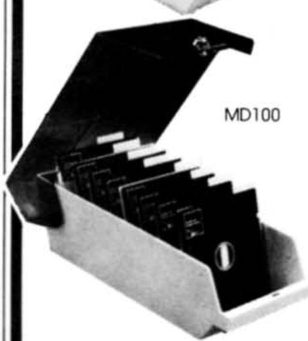

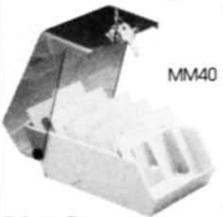

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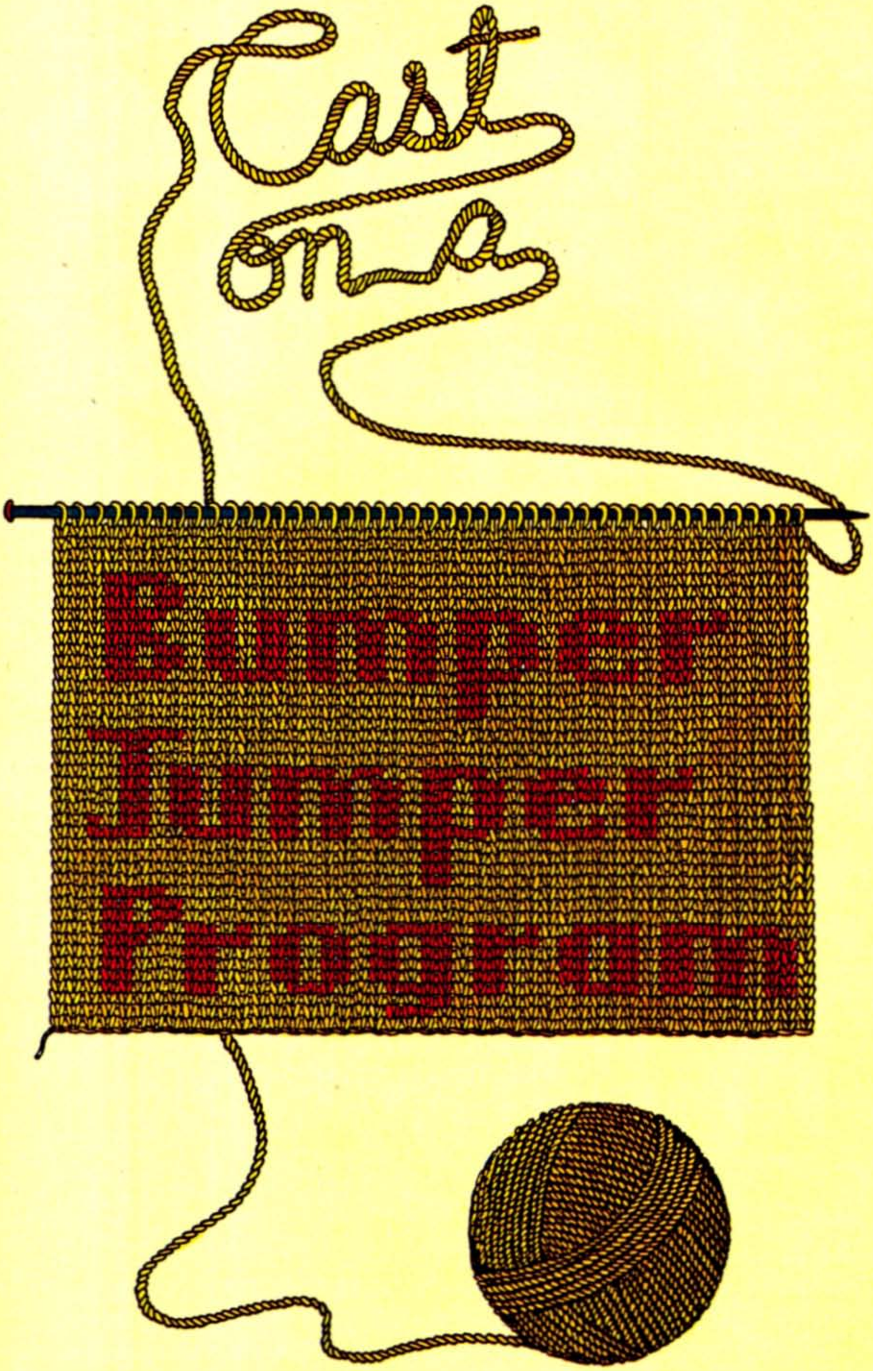
-MICRO MEDIA-MICRO MEDIA-MICRO MEDIA-MICRO MEDIA-

Create your own knitting patterns with this program from Kendall Down



ONE of the major criticisms levelled against software developers over the years is that they don't do enough to encourage women to take an interest in computing.

As a result, many women are missing out on the benefits of information technology enjoyed by their male associates, husbands and children.

Games players, school and college students, business users are amply catered for – but there's very little on the market that adult home-makers can identify with and which acts as an incentive to use a micro.

However *The Micro User* is taking a step to redress the balance with a knitting pattern program that allows you to design raglan-sleeved jumpers on a BBC Micro and print out your own money-saving patterns.

The program first asks you whether you will be using inches or centimetres. Answer I or C and you will then be asked for the knitting tension you require in terms of stitches and rows per inch or centimetre.

Usually the balls of wool will carry a recommendation as to what size of needles should be used. Unless the tension is already known, cast on 30 or 40 stitches and knit up a square of 20 or 30 rows.

Measure this sample to work out the stitches and rows per inch or centimetre. Typical values for four-ply wool on number 9 needles would be five stitches and 6.5 rows an inch.

The screen then clears and a grid is drawn on the left while a text area is set up on the right. Further prompts and output take place in this area.

The first prompt is for the chest size. An allowance is made for the fact that sweaters are usually worn over other clothing, so a 38 inch chest will in fact produce a garment that is 40 inches around.

The next three prompts are for vertical measurements. Rib size is the length of the rib, usually between 1.5 and 2 inches on adults. Allowance is made for the fact that rib is usually worked on needles two sizes smaller than those used for the main tension.

The program does not specify what sort of rib is to be used, and this is left to your experience. The most usual rib is *Knit 1, Purl 1* but any combination of knit and purl may be used for special effect.

Length to underarm refers to the total length to the armhole, including the rib and a typical value is 16 inches. This length varies according to the desired style of the garment.

The program does not attempt to make any vertical allowances for clothing worn under the sweater. Do not make the fit too snug under the armpit if you want to feel comfortable.

In the same way *Length to neck* refers to the total length of the finished garment, including rib. The best place to measure is along the spine to the back of the collar, and a typical value is 27 inches.

Once these measurements are entered the program draws the pattern shape; then the grid clears and the prompt *Printout? Y/N* appears.

Pressing N means that the pattern will be displayed in the text area on the screen only. For the convenience of those without printers, output is halted after each screenful, so press Shift to continue scrolling. If you wish to scroll continuously, simply hold Shift down.

Pressing Y enables the printer. Ensure that your printer is connected and switched on, otherwise the program will hang up and you will have to press Break.

The pattern is printed in the easy-to-read Elite typestyle (using Esc 77 or Esc "M") on Epson-compatible printers. If your printer does not support this feature it can be left out once you have the program running correctly.

It is better to leave it in until you are sure each line is correct, otherwise the cumulative checksum will not match.

The pattern is produced by actually measuring the drawing on the screen. As this is usually symmetrical, the pattern may, for example, instruct you to *Cast off 3 stitches on the left, cast off 3 stitches on the right, and knit 4 rows.*

Obviously it is not possible to cast off on both sides of the one row, so cast off at the beginning of the first row and work to the end, cast off at the beginning of the next row and work to the end, then work the next two rows.

Likewise the pattern may tell you to *Decrease 1 stitch on the left, decrease 1 stitch on the right, and work 2 rows.* You may simply knit two stitches together at each end of the first row, but a more usual form is *Knit 2, knit 2 together through back of loop, work to last 4 stitches, knit 2 together, knit 2.*

Once the pattern has been displayed or printed out, the pattern shape is redrawn and you are prompted to draw the neck using the * and ? keys. When the desired depth of neckline has been achieved, press Return and you are once again prompted for printout.

The pattern is printed, and the same comments apply as for the back. There is however one important point: When the point of the V-neck is reached the pattern instructs you to *Cast off x stitches on the right.* DO NOT CAST THESE STITCHES OFF.

Leave them on a spare needle and follow the pattern to the end. Then use these stitches and work the other side of the neck, reversing all shapings. This means that the instruction *Decrease 1 stitch on the right* will mean *decrease 1 stitch on the left* and so on.

The final measurement you have to enter is the sleeve length – from wrist to neck. The program then assumes that the rib length is the same as for the back and front, and works out the other measurements. The pattern shape is drawn and the pattern printed out.

And there you have it, a very effective solution to a knitting problem which shows a micro can do other things than playing games.

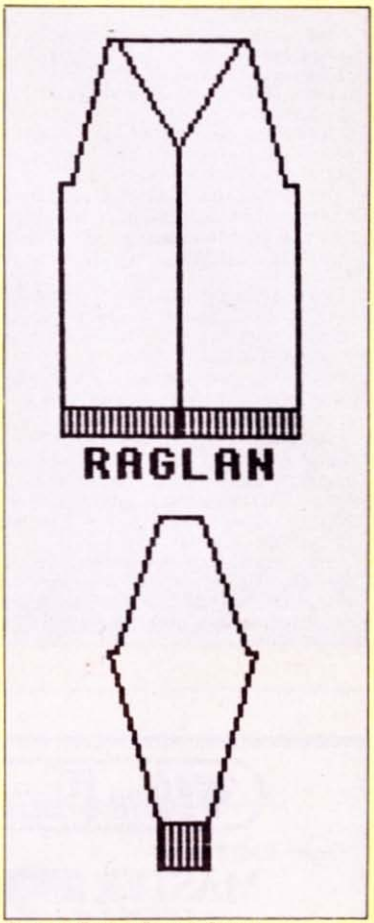


Figure I: Raglan Pattern Shape

```
   10 REM RAGLAN
   20 REM by Kendall Down
   30 REM (c) 1987 The Micro User
   40 MODE1:PROCinit:ONERRORVDU3:MODE7:E
ND
   50 CLS:PROCscreen:PROCback:END
   60 DEFPROCscreen:VDU19,1,4;0;19,3,3;0
;
   70 MOVE10,10:DRAW744,10:DRAW744,1014:
DRAW10,1014:DRAW10,10
   80 FORi%=0TO(998/yscale%)STEPs%:GCOL0
,3:MOVE0,20+i%*yscale%:DRAW10,20+i%*ysca
le%:GCOL0,1:DRAW744,20+i%*yscale%:GCOL0,
3:DRAW754,20+i%*yscale%:NEXT
   90 FORi%=0TO(714/xscale%)STEPs%:GCOL0
,3:MOVEtab%+i%*xscale%,0:DRAWtab%+i%*xsc
ale%,10:GCOL0,1:DRAWtab%+i%*xscale%,1014
:GCOL0,3:DRAWtab%+i%*xscale%,1024:NEXT
  100 VDU24,14;14;738;1004;:ENDPROC
  110 DEFPROCgrid:GCOL0,1:FORi%=0TO(998/
yscale%)STEPs%:MOVE10,20+i%*yscale%:DRAW
744,20+i%*yscale%:NEXT:FORi%=0TO(714/xsc
ale%)STEPs%:MOVEtab%+i%*xscale%,10:DRAWt
ab%+i%*xscale%,1014:NEXT:ENDPROC
  120 DEFPROCmirror:MOVE(m%+(m%-X%(D%-1)
)),Y%(D%-1):FORi%=D%TO0STEP-1:DRAW(m%+(m
%-X%(i%))),Y%(i%):NEXT:ENDPROC
  130 DEFPROCback:VDU28,24,31,39,0:COLOU
R129:CLS:COLOUR3:PRINT"Scale-1:";s%" "s$
:VDU28,24,31,39,1:INPUT""Chest size:"si
ze%:base=INT(size%+(size%*.05265))/2*xsc
ale%
  140 m%=tab%+(base DIV2):X%(0)=m%:Y%(0)
=20:X%(1)=tab%:Y%(1)=20:MOVEX%(0),Y%(0):
DRAWX%(1),Y%(1)
  150 m%=tab%+(base DIV2):INPUT"Rib len
gth:"rib:X%(2)=tab%:Y%(2)=20+(rib*yscale
%):DRAWX%(2),Y%(2)
  160 INPUT"Length to""underarm:"under
:X%(3)=tab%:Y%(3)=20+(under*yscale%):DRA
WX%(3),Y%(3)
  170 castoff=(size%/57)*(xscale%):X%(4)
=tab%+castoff:Y%(4)=20+(under*yscale%):D
RAWX%(4),Y%(4)
  180 INPUT"Length to""neck:"total:sti
tches%=((size%+2)/2)*spi:top%=stitches%/
PI+stitches%/size%:X%(5)=tab%+INT((((sti
tches%-top%)/2)/spi)*xscale%):Y%(5)=20+t
otal*yscale%:X%(6)=m%:Y%(6)=20+total*ysc
ale%
  190 DRAWX%(5),Y%(5):DRAWX%(6),Y%(6):D%
=6:PROCmirror
  200 PROCpattern("BACK",stitches%,tab%+
INT((((stitches%-top%)/2)/spi)*xscale%)+
4,20+total*yscale%):CLG:PROCgrid:GCOL0,3
:PROCdrawback:COLOUR3:PRINT"Use * and ?
keysto draw neckline<RETURN> to end"
  210 x%=tab%+(base/2):s%=tab%+INT((((st
itches%-top%)/2)/spi)*xscale%)+8:e%=tab%
+base-INT((((stitches%-top%)/2)/spi)*xsc
ale%)-8:y%=20+total*yscale%:y1%=y%:GCOL4
,2
  220 MOVEs%,y%:DRAWx%,y1%:DRAWe%,y%:GCO
L3,2:REPEAT:MOVEs%,y%:DRAWx%,y1%:DRAWe%,
y%:g%=GET:MOVEs%,y%:DRAWx%,y1%:DRAWe%,y%
:IFg%=58y1%=y1%+4 ELSEIFg%=47y1%=y1%-4
  230 UNTILg%=13:GCOL0,3:MOVEs%,y%:DRAWx
%,y1%:DRAWe%,y%:D%=7:X%(6)=s%:Y%(6)=y%:X
%(7)=m%:Y%(7)=y1%
  240 PROCpattern("FRONT",stitches%,tab%
+INT((((stitches%-top%)/2)/spi)*xscale%)
+4,20+total*yscale%)
  250 D%=0:CLG:PROCgrid:COLOUR3:INPUT"Wr
ist to""shoulder";arm:sbase=INT((stitch
es%/PI)+(spi*2.7))*4:base=base*.75:stitc
hes%=stitches%*.75:t%=tab%+(base/2)-(sba
se/2):m%=tab%+(base/2):X%(0)=m%:Y%(0)=20
:X%(1)=t%:Y%(1)=20
  260 GCOL0,3:MOVEX%(0),Y%(0):DRAWX%(1),
Y%(1):X%(2)=t%:Y%(2)=20+rib*yscale%:DRAW
X%(2),Y%(2):t%=tab%+(base/2)-(sbase/2):s
under=arm-(total-under):X%(3)=tab%:Y%(3)
```

Turn to Page 38 ►

```
=20+sunder*yscale%:DRAWX%(3),Y%(3)
  270 X%(4)=tab%+castoff:Y%(4)=20+sunder
*yscale%:DRAWX%(4),Y%(4)
  280 stop%=(sbase/22.5):X%(5)=tab%+INT(
(((stitches%-stop%)/2)/spi)*xscale%):Y%(
5)=20+arm*yscale%:DRAWX%(5),Y%(5)
  290 X%(6)=m%:Y%(6)=20+arm*yscale%:DRAW
X%(6),Y%(6):D%=6:PROCmirror
  300 PROCpattern("SLEEVE",sbase/4,tab%+
INT((((stitches%-stop%)/2)/spi)*xscale%)
+4,20+arm*yscale%):ENDPROC
  310 DEFPROCpattern(a$,b%,t%,tp%):PRINT
"Printout? Y/N";:g%=GETAND223:CLG:GCOL0
,3:VDU29,0;0;:PROCdrawback:CLS:k%=TRUE:I
Fg%=89VDU2,1,27,1,77,1,14:PRINTa$ELSEVDU
14
  320 FORi%=X%(1)TOm%+(m%-X%(1))STEP8:MO
VEi%,20:DRAWi%,20+(rib*yscale%):NEXT:A%=
13:X%=P%MOD256:Y%=P%DIV256:GCOL1,2:COLOU
R2:PRINT"Cast on ";b%" stitches, and ";
  330 p%=Y%(2)+4:PRINT"work ";INT((p%/ys
cale%)*(rpi+.5))" rows of rib.""Continu
e in pattern ";
  340 temp%=(b%*4)-8:FORg%=1TO2:PLOT77,t
%,p%:CALL&FFF1:L%=FNleft:R%=FNright:p%=p
%+4:NEXT:row%=2:IFR%-L%>temp%PRINT"cast
on ";((R%-L%)-temp%)DIV8" stitches, ";EL
SEIFR%-L%<temp%PRINT"cast off ";(temp%-(
R%-L%))DIV8" stitches, ";
  350 temp%=R%-L%:REPEAT:REPEAT:PLOT77,t
%,p%:CALL&FFF1:l%=FNleft:r%=FNright:p%=p
%+4:row%=row%+1:UNTILr%-l%<>temp%ORp%+6>
tp%:PRINT"and work ";row%" row"+CHR$(115
*(row%>1)*-1)" in pattern.":cap%=0
  360 IFABS((l%-L%)DIV4)>1PROCdef1 ELSEP
ROCdef2
  370 IFl%>L%PRINTc$(0)of$;(l%-L%)DIV4"
stitch"f$(ABS((((l%-L%)/4)>1))" on the le
ft, ";:cap%=1 ELSEIFl%<L%PRINTc$(2)on$;(
L%-l%)DIV4" stitch"f$(ABS((((L%-l%)/4)>1)
)" on the left, ";:cap%=1
  380 IFABS((r%-R%)DIV4)>1PROCdef1 ELSEP
ROCdef2
  390 IFr%<R%PRINTc$(cap%)of$;(R%-r%)DIV
4" stitch"f$(ABS((((R%-r%)/4)>1))" on the
 right, ";ELSEIFr%>R%PRINTc$(cap%+2)on$;
(r%-R%)DIV4" stitch"f$(ABS((((r%-R%)/4)>1
))" on the right, ";
  400 temp%=r%-l%:L%=l%:R%=r%:row%=0:IFp
%>1000IFk%=TRUE CLG:VDU29,0;-(yscale%*12
);:PROCdrawback:k%=FALSE
  410 UNTILp%+6>tp%:PLOT77,t%,p%:CALL&FF
F1:l%=FNleft:r%=FNright:PRINT"Work one r
ow in pattern and cast off the remaining
 ";(temp%DIV4)+2" stitches."":VDU3,15:P
ROCdef1:ENDPROC
  420 DEFFNleft:=?P%+(P%?1)*256
  430 DEFFNright:=P%?4+(P%?5)*256
  440 DEFPROCdrawback:MOVEX%(0),Y%(0):FO
Ri%=0TOD%:DRAWX%(i%),Y%(i%):NEXT:PROCmir
ror:ENDPROC
  450 DEFPROCdef1:c$(0)="C":c$(1)="c":c$
(2)="C":c$(3)="c":on$="ast on ":of$="ast
 off ":ENDPROC
  460 DEFPROCdef2:c$(0)="De":c$(1)="de":
c$(2)="In":c$(3)="in":on$="crease ":of$=
"crease ":ENDPROC
  470 DEFPROCinit:PRINTTAB(0,10)"Inches
or Centimetres? I/C";:REPEAT:g%=GET AND
223:UNTILg%=67 OR g%=73:IFg%=73 s$="inch
":s%=1 ELSE s$="cm.":s%=5
  480 PRINT""Number of stitches per "s$
;:INPUTspi:PRINT"Number of rows per "s$
;:INPUTrpi:xscale%=spi*4:yscale%=rpi*4:t
ab%=10+xscale%
  490 mx%=10:DIMX%(mx%),Y%(mx%),P% 8,f$(
1),c$(3):N%=TRUE:PROCdef1:ENDPROC
```

Get it right!

```
 10 =    0 0 | 180 = C5BF 9 | 350 = 7B0D 3
 20 =    0 0 | 190 = 31A2 E | 360 = 15C2 7
 30 =    0 0 | 200 = 2C89 8 | 370 = C232 B
 40 = 2605 5 | 210 = E8DF A | 380 = 18D4 8
 50 = 1788 0 | 220 = CDC5 1 | 390 = 7E2C C
 60 = 1A67 D | 230 = EDCA 9 | 400 = 5A77 1
 70 = FFCC A | 240 = C09D C | 410 = F0B0 C
 80 = 1A2E 5 | 250 = 6AA1 4 | 420 = 5EBF 9
 90 = F592 9 | 260 = 3B2D 4 | 430 = 3E01 A
100 = D424 F | 270 = 82D5 9 | 440 = 9BF7 7
110 = 99A8 5 | 280 = 88BD D | 450 = 1732 9
120 = F178 F | 290 = B478 8 | 460 =  CC5 0
130 = A8A6 1 | 300 = 599E 5 | 470 = BE27 9
140 = BE89 E | 310 = F115 6 | 480 =  D60 3
150 = E640 A | 320 = 1B06 4 | 490 = FB96 2
160 = E2AF F | 330 = CCF8 4 |
170 = CB5C 4 | 340 = FCE1 4 |
```

Vine Micros

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Pete Bibby goes deeper into the logic behind conditional statements

SERIES

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BEGIN HERE
Part 18

The ins and outs of IFs

LET's start by looking at Program I, the final program we dealt with last month. You'll see that it uses the IF . . . THEN . . . ELSE which we learnt about then.

```
    10 REM Program I
    20 INPUT "Enter the score " score
    30 IF score >= 100 THEN PRINT "It
 's a century " ELSE PRINT "It's not
 a century"
```

The first two lines just label the program and take in a value, storing it in *score*. The following line then evaluates the condition:

```
score >= 100
```

to see what happens next. If it's true, say *score* is 150, then the statement after the THEN is performed. If it's not true, perhaps *score* is 20, the code after the ELSE is executed.

Either way an appropriate message is printed.

Now suppose we wanted our cricket program to be a little more sophisticated. (Could it be less?) Let's have it so that it tells us if the score is 0, the well-known duck. We could do this with the line:

```
35 IF score=0 THEN PRINT "It's a duck"
```

but that would be too simple, wouldn't it? No, we macho programmers look askance at testing the value of *score* twice when only once would do. We prefer the likes of Program II.

```
    10 REM Program II
    20 INPUT "Enter the score " score
    30 IF score >= 100 THEN PRINT "It'
 s a century " ELSE IF score=0 THEN PR
 INT "It's a duck " ELSE PRINT "It's n
 ot a century"
```

Line 30 is the one to watch. The first part of it is familiar, it just tests the condition and, if *score* is greater than or equal to 100, confirms that it's a century.

But what happens if *score* is less than 100? From what we've learnt before, the answer is obvious – the micro looks at the bit of code after the ELSE and does that. But what if the bit after the ELSE is itself an IF? That's what happens in Program II.

The answer is that the micro takes this in its stride. As far as it's concerned, this is just an IF statement like any other and it deals with it in just the same way. To whit, it looks at the condition between the IF and the THEN and tests it to see if it's true or not. In this case the condition is:

```
score=0
```

Should the score actually be zero the code after the THEN is executed and the micro displays your shame. If the condition is false – perhaps you got 99 – then the bit after the ELSE is performed.

This method of having IFs tucked away inside other IFs is called "nested" IFs. And they are easier to use than they look, provided that you don't let them see that you're frightened of them.

The trick is to remember that while we see lots of IFs and THENs and ELSEs all in one line and get confused as to which belongs to which, the micro doesn't. It takes one IF at a time, works out its condition and does one of the two actions specified. The first IF is forgotten about entirely as the micro goes on to execute the chosen code.

Should this happen to be an IF the process starts again. But no matter how many IFs are chained together, the micro takes them one at a time, working its way through the alternatives as the conditions prescribe.

Having said all that, you can get problems with nested IF . . . THENs. Suppose that line 30 had been:

```
  30 IF score >= 100 THEN PRINT "It's a
century " ELSE IF score>=200 THEN PRINT
"It's a double century " ELSE PRINT
"It's not a century"
```

There's nothing wrong with this line; the micro will accept it quite happily. Yet there's something irredeemably silly about it. Can you see what it is? If you can't, try running the altered program with a *score* of 200 or over.

The point is that you never get the double century message. This is because it lies in the ELSE part of the first IF. With a *score* of 200 or over the condition:

```
score>=100
```

is obviously true. Hence the program does the bit of the line after the THEN. The part after the ELSE is ignored and consequently the double century message is lost. So you can use nested IFs, but be careful that you use them properly.

Program III shows a rather more complicated example which I leave to you to figure out. It's not hard if you take it IF by IF, but you can see how easily it would be to lose track of what's happening and have a THEN or an ELSE that never gets executed.

```
    10 REM Program III
    20 INPUT "Enter the score " score
    30 IF score >= 100 THEN PRINT "It'
 s a century " ELSE IF score=0 THEN PR
 INT "It's a duck " ELSE IF score <0 T
 HEN PRINT "Liar!" ELSE PRINT "It's no
 t a century"
```

Program IV shows our nested IF . . . THENs used to decide whether a number is positive, negative or zero. While this may seem fairly trivial, if it was an analysis of your bank account you'd probably agree how important it was!

```
    10 REM Program IV
    20 PRINT "Give me a number"
    30 INPUT number
    40 IF number >0 THEN type$="positi
 ve" ELSE IF number<0 THEN type$="nega
 tive" ELSE type$="zero"
    50 PRINT ;number " is "type$
```

The work of the program is done in line 40. Here the value of *number* is tested and its type reported. Take a close look at the battery of tests *number* has to go through.

First of all it's tested to see if it's greater than zero. If it is, the code after the THEN sets *type$* to positive and the program goes on to line 50. Should *number* not be positive, then the first condition is false and the micro goes on to the code after the ELSE.

This in itself is another IF . . . THEN . . . ELSE statement. Notice that by the time this bit of Basic is reached, we know that *number* is either zero or negative. It can't be positive. The condition of this second IF tests *number* and the relevant message is placed in *type$*.

I think of this succession of IFs and their conditions as though *number* were running a gauntlet. Only if all the conditions are found to be false does the program execute the code after that final ELSE. In a way you can look on it as the "catch all" part of the line, the bit that deals with the left over values that may have filtered through the previous tests.

Program V again has a numeric variable, *number*, running the gauntlet of a couple of IFs. Only now the IFs are inside a FOR...NEXT loop which cycles five times. Each time a different value is read into *number*. And what line 40 does depends on this varying value. Can you predict what will happen?

```
   10 REM Program V
   20 FOR loop=1 TO 5
   30 READ number
   40 IF number>10 THEN IF number<20
THEN PRINT number" is between 10 and
20"
   50 NEXT loop
   60 DATA 1,12,67,25,19
```

The first time round the loop *number* takes the value 1. Obviously the first condition is false – a 1 certainly isn't greater than 10. There's no ELSE part so line 40 produces no output.

Next time through, *number* has the value 12 and this provokes a reaction from line 40. The first condition is true – 12 is greater than 10 – and so the micro goes on to process the bit after the THEN. This is itself an IF...THEN statement with the condition:

```
number<20
```

Now this is also true, 12 is less than 20, and so the part after the second THEN is performed. This tells us that 12 is between 10 and 20. I'll leave it to you to figure out what happens the next three times round the loop.

There are two points to notice about Program V. The first is the way that the two conditions combine to ensure that the only action taken is for a certain range of values. If *number* is 1 or 78, nothing happens.

The second point is that you have to be very careful with your conditions. To see what I mean, try changing line 60 to:

```
60 DATA 10,13,15,17,20
```

You might think that all of these values will trigger a reaction as they're all between 10 and 20. You'd be wrong though. 10 and 20 are ignored. This is because the conditions are greater than 10 and less than 20 respectively. If we'd meant the program to include 10 and 20 in the range of values that ran the gauntlet, then Program V is wrong.

```
   10 REM Program VI
   20 FOR loop=1 TO 5
   30 READ number
   40 IF number>=10 THEN IF number<=2
0 THEN PRINT; number" is between 10 a
nd 20 inclusive"
   50 NEXT loop
   60 DATA 10,13,15,17,20
```

In this case the clipping of the extreme values at either end of the range isn't all that important. However if it was a program dealing with income tax allowances, you might think differently!

Program VI shows how Program V can be tailored to include 10 and 20 in the range of values accepted. Can you alter it so that all values except those between 10 and 20 trigger off a message? Or have the program deal with three ranges of numbers, 0 to 20, 21 to 100 and 101 upwards?

● *More on pairs of conditions next month.*

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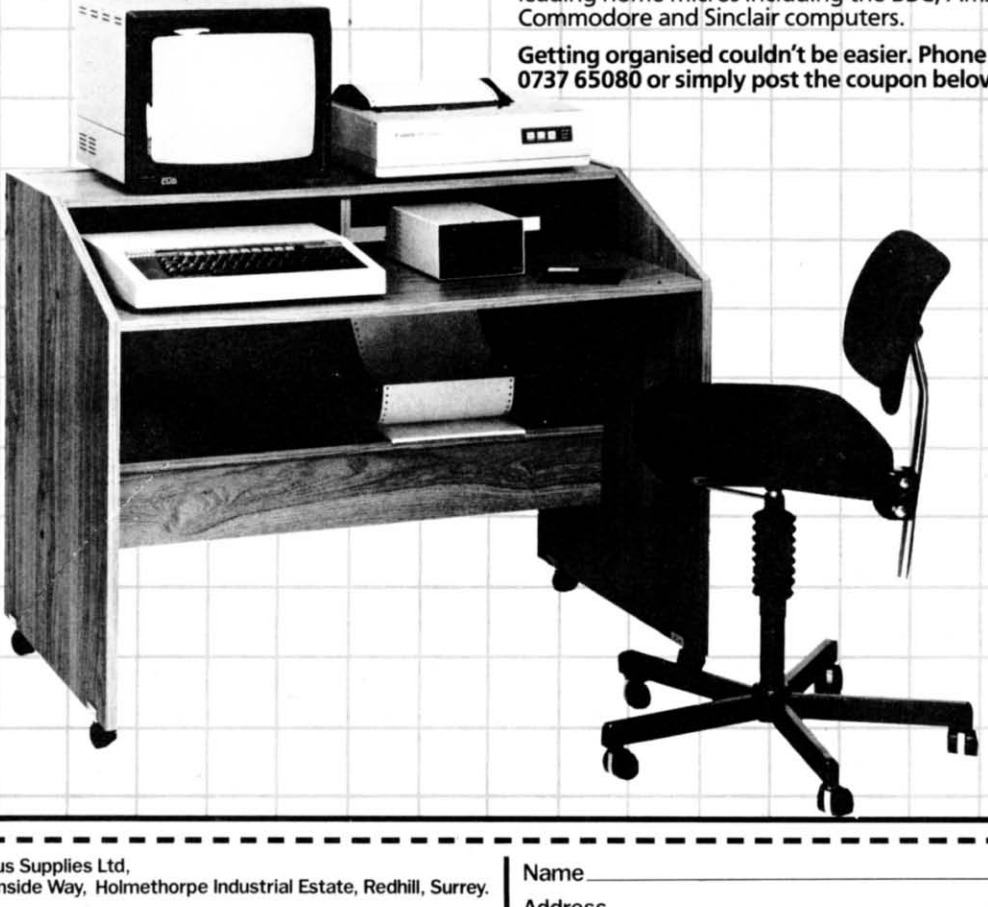

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Avoiding the crocodiles in ancient Egypt

ONE of the few really big adventures for the BBC Micro is Acornsoft's Acheton. It is only available on disc, and its extra size means that the disc has to be accessed quite frequently.

While this inevitably slows the speed of response to your input, I have not found this to be a crucial drawback. There has to be a trade-off between size of game and speed if sideways ram or second processor memory is not specifically catered for in a game.

I have had a few letters about Acheton and must confess that I've not always been able to answer queries, simply because I have not yet finished the game myself.

The authors have been kind enough to send me details of the moves needed to solve the adventure, but I don't believe in cheating. However, I am willing to guess at answers based on what they tell me if you ask – even though I am not using it to my own advantage.

Where Acheton is of interest to all adventurers is at the start: There is an intriguing twist to the way the game opens. The first few locations are shown in Figure I.

Hall of Fame

Marcus Turner has sent me a full solution to **Emerald Isle**. I shall use some of it in future columns dealing with this attractive game.

Sue Roseblade has sent me a full solution to Colisoft's **Programmer's Revenge**. Since Colisoft has just sent me a cassette, I'm not going to peep, but Sue says the rose garden maze is truly awful.

Paul Liddell (aged 5) can score 60,000 plus six lives in **Crystal Castles**: How it is done will be revealed on request. His dad can get 40,000 (sometimes).

S.B.Swinton has sent full maps of **Lord of the Rings** – thanks.

Finally, I am grateful to Squadron Leader A.D. Marter for the superb solution to **Erik the Viking**.

First, notice how Acheton has a puzzle very early on in the game. I admit that I found the answer almost at once, because whenever I find a tree, I always try to climb it.

Once up the tree, I moved laterally in each direction before climbing down again. This is something I always do.

Thus I quickly found that going D from location seven put me into the game proper. It didn't stop me exploring around to map the rest of the area above ground though.

Co-author Dr. Jon Thackray was a trifle worried that people would get themselves stuck at the start and give up. That is why an alternative way into the main game is offered, though my map doesn't show it.

I hope that only a few found this opening impossibly difficult, but I am still an advocate for easy beginnings to adventure games which then let the puzzles escalate steadily.

Second, notice how good games designers let you have plenty of (not always useful) equipment to choose from right at the start of an adventure.

Finally, a plea for help: I have only been able to spend a week working seriously on Acheton to date. So, am I right about that well – Location 9? Is there a way of going down it safely which I haven't found?

While on the subject of disc-based adventures, I have recently had my attention drawn to a new one by Duckworth which looks promising.

Egyptian Adventure is by Ray Davies, and is priced at £14.95 from Duckworth, The Old Piano Factory, 43 Gloucester Crescent, London NW1 7DY.

The game runs on a Model B or Master 128, and copes with single or dual drives. I found this feature particularly useful as I could put a save-game disc into drive 1 of my dual drives, which was then used automatically whenever I wished to update a save.

I felt the background to the adventure was particularly well written, albeit briefly. I suppose I liked it because I have studied ancient history in my time.

Set on the banks of the Nile, close to Heliopolis, the scenario captures your interest from the very beginning.

There are plenty of good long text descriptions which help to maintain the atmosphere. What is more, they are actually literate, which is an added bonus after some of the gauche spelling mistakes I have seen recently.

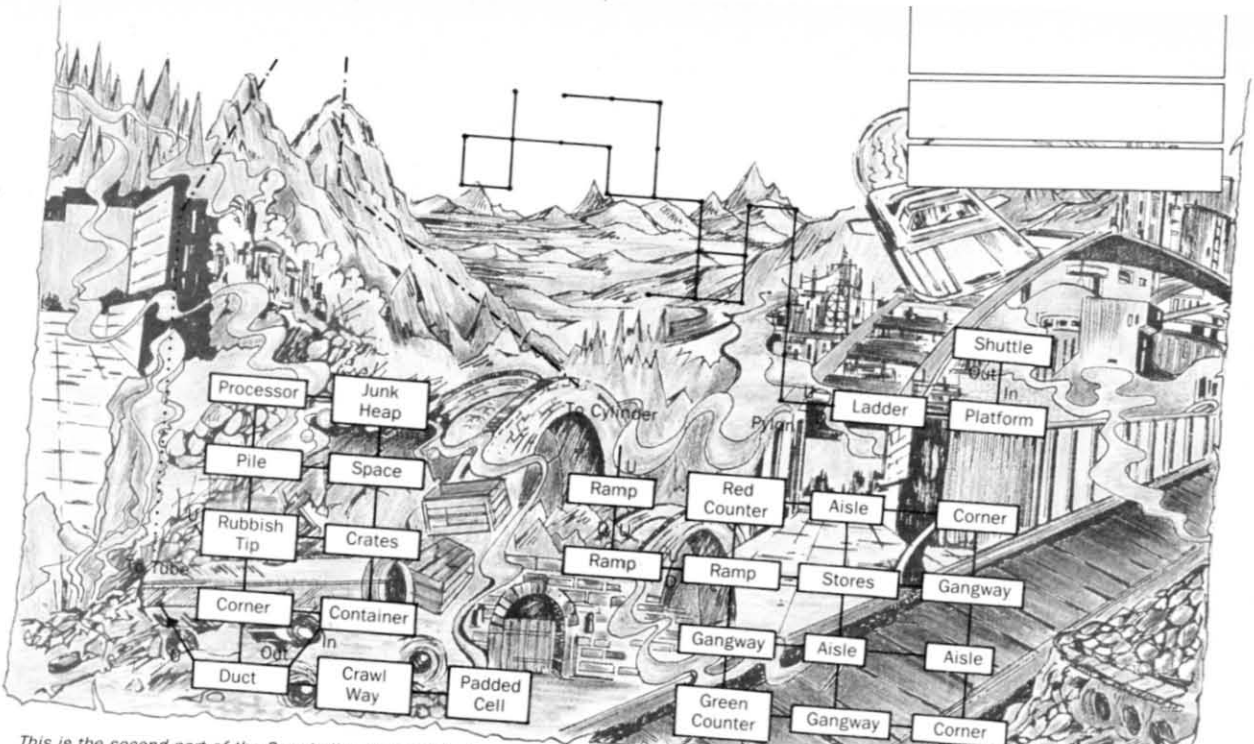
Your task is to investigate the mysterious death of Professor Harold Johnson who was searching for the tomb of a long dead Egyptian high priestess.

The puzzles start very quickly indeed, and I found myself eaten by crocodiles as a consequence of not showing sufficient respect!

This adventure is not a rambling romp

Room	Description	To	Move	Result
1	End of road	Farmhouse	N	2
		Open field	E	4
		Depression	S	8
		Forest	W	10
2	Hallway of disused farmhouse Lamp; Can of paint; Keys; Empty bottle.	Doorway	NW	3
		Road end	S	1
3	Dark storeroom Light lamp; Huge axe.		SE	2
		Avenue	E	5
4	Open grassy field	Road	W	1
5	Enchanted forest Climb tree.		N & D	4
			E & D	6
			S & D	7
			W & D	5
6	Fighting way through forest			
7	In enchanted forest	Hole	D	14
8	Depression	Locked steel grate	D	9
9	Well Don't bother, you drown!			

Figure I: Acheton: Logical map



This is the second part of the Snowball map we started in the May issue – and there'll be more next month

with the occasional puzzle thrown in. There are quite complicated chaining puzzles and other problems to solve which turn up frequently.

In the first 15 of the 100 or more locations there are eight items to be acquired, one way or another, and five characters you must persuade to do your bidding. The most crucial of your early tasks is to obtain a loan from the bank manager.

Incorrect actions are met with a variety of responses from the mildly insulting "Boring, boring, boring!" to the suggestion that you'd do better to take up arcade games instead.

There is an interesting twist to the maze in this game. It's been done before I know, but once again you cannot map this maze by dropping objects – they get snatched – you have to talk your way out instead. A hint sheet providing clues rather than solutions is available, and answers to specific problems are provided if you write to Duckworth and enclose a stamped addressed envelope.

Egyptian adventure deserves a four star rating, but I must issue the caveat that it's a game for intermediate adventurers upwards, not beginners, although Ray Davies does start off with easy problems.

One last point to encourage writers and software houses: I didn't find the disc access time a nuisance. I'll put up with that any day for larger games.

Regarding my progress on the new version of Elite, I am still only Deadly. I haven't started my second mission yet, and I no longer think the energy bomb is a weapon for wimps! On the other hand, I am fairly comfortably off, and usually make a handsome profit on each voyage.

Helpline

Marcus Turner offers tips for ***Spiderman***: To get the gem from Sandman, climb the ceiling and enter his room; examine the crib to find the baby formula and the gem. In the lift, examine the niches as you go up.

To get Lizardman's gem, get the calcium and chloride, go to the lab and mix them then go back and throw the mixture at him. If you then examine him you find a gem.

Bryan Gorman offers further help to Miss T. Mell in ***Circus***: The tiger can be moved by cracking the whip found in the cupboard to the east of the entrance. However, can someone help him open the maintenance wagon?

R.P. Storey can't quite complete the initial module of ***Myorem***.

The full sequence goes like this: Think, push, then take the drum, stand on it and climb the creeper to get the twig. Get the can from the rubbish tip, frustrate the spider by blocking the hole with the can and take the bag. Now block the spider hole with the lid.

Next, climb the creeper again and cut it with the can, then swing till you can land on the rubbish before letting go. After that, block the spider hole with the can again and put the lid on the drum. Tie the creeper to the drum; then if you hold the creeper you can safely jump into the culvert. As I said in my review, it was an interesting and tricky puzzle.

Problem Corner

N. Gregory would like to know how to kill the Ravenbees in Superior's **Ravenskull**: Jonathan Temple says use the "Slow" potion. But where is the key to the third gate in the centre of the first level?

Mark Outten wants to know how he can move SW from the green room in **Classic Adventure** without a lamp.

He's having problems with **Dodgy Geezers**, too. How does he lift the manhole cover, how can he get Tweedle to cooperate and how does he enlist Soapy?

D.N. Bonner has been enjoying the **Mayday** adventure on our own Database Classic Arcade Games collection (now into its third year), but can't get the computer control switched on. Believe it or not the author, Steve Turnbull, can't remember what to do either. Can any reader solve the problem, please?

Rebecca Wombwell has troubles in **Countdown to Doom** with the volcano and the acquisitive metal dome: Help, please.

Marcus Turner is stuck in **Spiderman**: How do you get past the ringmaster, what use is the mirror and how do you get Mysterio's gem?

Teacher John Sanderson has lost the turtle and its key in the Association of Maths Teachers' **"L"** game; if it is in the courtyard, how does he enter?

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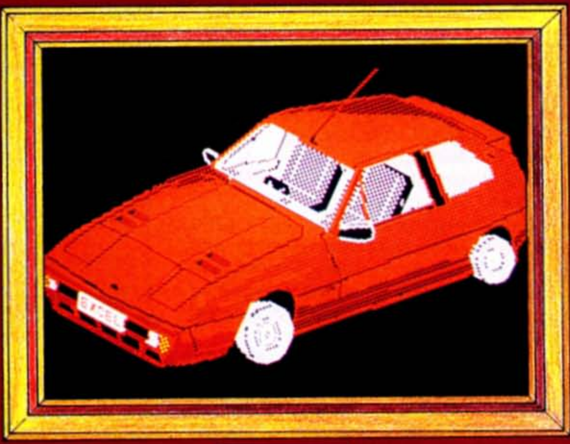
GALLERY

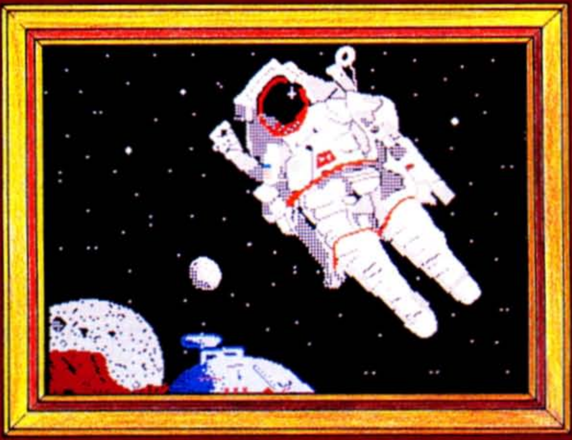
No. 3

THANKS for the pictures that you keep sending us – keep them coming in. This month we feature some works of art by Stephen Neale. We don't mind whether it's just one masterpiece or a full gallery that you send us – if your pictures are good you'll see them in print. Please send screen dumps on disc or tape with a note saying which mode they use.

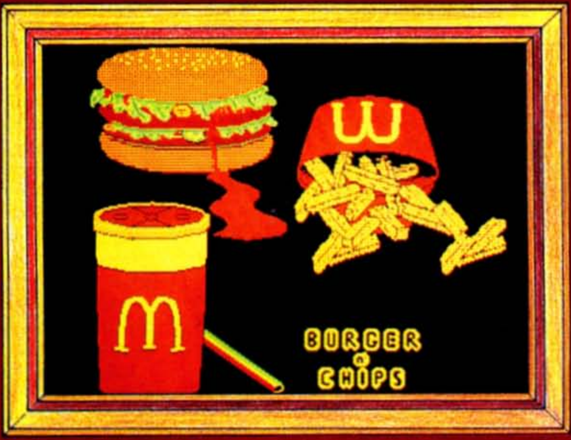
The address to send them to: Gallery, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.



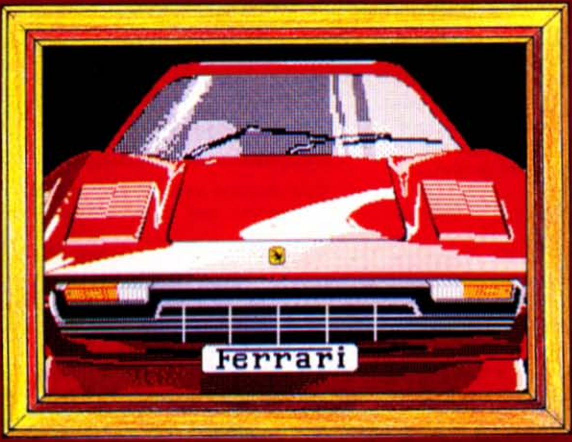
Dream car



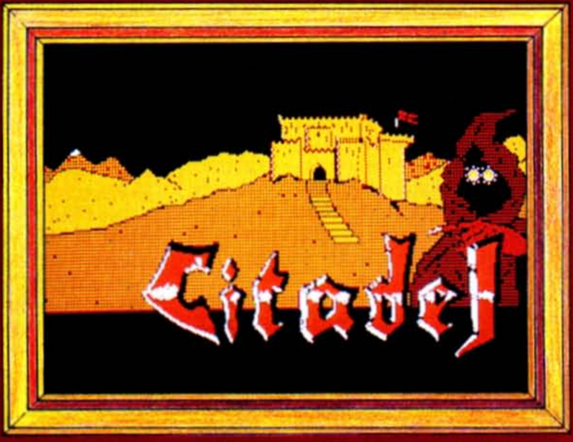
Space race



Chips with everything

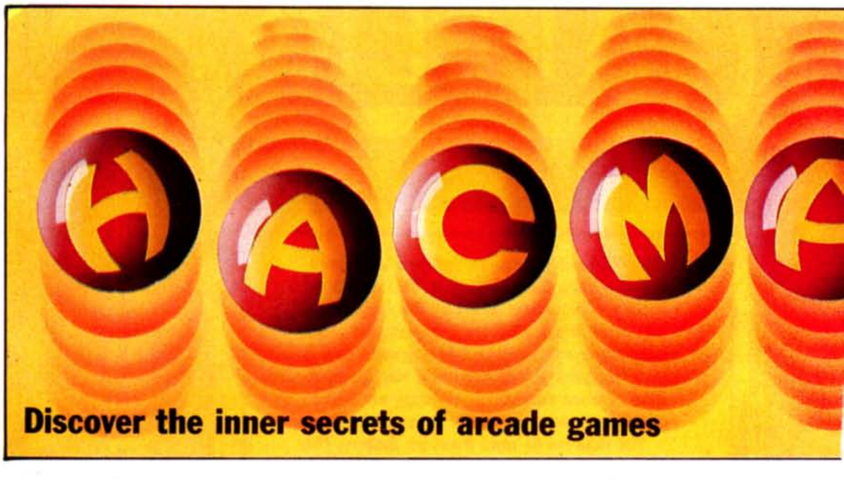


Fantastic Ferrari



The Citadel

Part 4



Discover the inner secrets of arcade games

THIS month kicks off with a quite remarkable piece of co-operation: A complete set of hints and pokes, plus a map for Audiogenics' game Thunderstruck II: The MindMaster – kindly sent by Darryl Still of Audiogenic.

The game involves moving a little droid around, collecting objects and giving them to other droids. The aim is to rebuild a shattered secret weapon in order to destroy the MindMaster of the title.

Needless to say you must give the right object to the right robot. The game combines all the best elements of both arcade and adventure games.

Thunderstruck II centres on finding a number of keys, each of which is used to open the appropriate door. Acquiring these keys involves solving a series of "chaining" puzzles – a technique beloved of authors of adventure games – as well as dodging various animated nasties. So for the commentary on the game read the accompanying panel.

Darryl has also sent "infinite energy" routines suitable for both cassette and disc versions of the game – see Listing I. Thank you very much, Darryl.

Remaining with Audiogenic for a moment, I've been spending a lot of time recently at Gary Partis's latest game, Sphere of Destiny. Although a close take-off of a Spectrum game, Trailblazer, Sphere is an absolute masterpiece of programming.

It features many of todays favourite touches such as delicate music and a long scrolling message, plus a rarely-seen option allowing up to four players. What a pity it's so difficult. Yes, Gary, I know you don't think so!

Each of the 64 levels has its own title. Some are very funny indeed, and it's well worth practising the game just to see them. And as for your reward for completing level 64...

The loading routine used on Sphere, like that on another Partis game, Psycastria, features a simple but very good idea: The tape block numbers count down from 255 to zero, showing at a glance how much longer the game will take to load. One particularly impressive

One particularly impressive feature is feature is that the screen is split in at least seven places – possibly more.

This technique allows the simultaneous display of a greater number of colours than is normally possible in any given graphic mode.

I have seen it used to great effect in games such as Yie Ar Kung Fu and Way of the Exploding Fist, but never before to quite this degree. Pause the game and watch the shimmer at each point the screen is changing colour.

Another ingenious trick is having two different display modes on the screen at once. You thereby obtain an ideal combination of high resolution graphics and pretty colours – a technique, to my knowledge, first seen in Elite.

I still find Sphere of Destiny more than a little too difficult – not to say nearly impossible – but it's without doubt a very addictive game and one destined (sorry) for great things.

Last month I covered a routine that enables the Master version of Stryker's Run to be used on a Model B equipped with the Solidisk 256k fourmeg board. It is in fact perfectly possible to persuade this game to run on a Model B with any sideways ram board with 64k or above, as long as it has a 65C02 processor on the main board, not in a second processor.

The Master uses a 65C12, a development of the 6502 chip used in the standard BBC Micro. One of the 65C12's more exciting features is an enhanced instruction set, allowing for more efficient coding as one instruction can replace two or more on the 6502.

The problem with Stryker's Run is that the Master version was written to take advantage of these instructions and therefore won't work on a straight 6502. The 65C02, as used in the 6502 Second Processor, has these necessary codes.

For most BBC Micros, simply remove the 6502 (IC1) and insert a 65C02, available from any good chip shop, for about £11.

Some machines, however, cannot cope with the timing of the faster chip and give erratic screen display and keyboard response. If your micro behaves like this, the problem can be solved by soldering 220pF capacitors between legs 7 and 11 of IC29, and legs 7 and 11 of IC37. The 65C02 can now be left in permanently and virtually all other software will run.

Alternatively, the old 6502 would still work perfectly with these capacitors in place. My grateful thanks to Mark of Solidisk for this very useful tip.

With the above hardware modifications, owners of the Solidisk 128K board should type in last month's Listing II with the new lines:

```
60 ?&FE62=15:?&FE60=A%:*L.data1 8000
70 ?&FE60=C%:*L.data2 8000
80 ?&FE60=D%:*L.data3 8000
90 ?&FE60=B%:*L.data4 8400
```

Owners of Watford Electronics' rom/ram card should make the following modifications:

```
 50 A%=0:B%=1:C%=2:D%=3:HIMEM=&D00
:*FX15,1
 60 ?&FF30=0:*L.data1 8000
 70 ?&FF32=0:*L.data2 8000
 80 ?&FF33=0:*L.data3 8000
 90 ?&FF31=0:*L.data4 8400
```

Can anyone oblige with equivalent routines for any other sideways ram boards?

You just can't keep a good man – or reptile – down. Repton is back again with pokes and other goodies galore. Gavin Nicholas from High Wycombe writes in with a tip useful when tackling the higher levels. On levels A-E pressing M will display a map of the screen, freezing the countdown timer.

This option is not available on the last three screens. On these, however, pressing M still freezes the timer, allowing you to complete the screen at your leisure.

If you press Return to view your status, don't forget to press M again after returning to the game, otherwise the clock

```
Cassette:
10 FOR I%=0 TO 2 STEP 2:P%=&63F:[OPTI%
20 LDA# inter MOD 256:STA &220
30 LDA# inter DIV 256:STA &221
40 .inter PHP:PHA:LDA#40:STA &42C:PLA:
   PLP:RTS
50 ]:NEXT:*FX 14,4
60 CALL &63F

Disc:
*LOAD MASTER
?&2001=49
CALL&1A50
```

Listing I: Cheats for Thunderstruck II

will start counting again.

M.C. Rogers of Colchester has provided a method of viewing the Repton screens. If you have Repton 3 on disc, type the following:

```
PAGE=&900
*DIR D
LOAD"REPTON1"
5 MODE 5
115 ?&304A=9
RUN
```

If you've used the Repton 3 editor you'll know how easy it is to define a complicated character in one position, only to realise it should be in another. Furthermore, you've probably designed a set of screens and found that the first is by far the most difficult and that you really want it at the end.

Andy Muir of Norwich has the solution – a complete dissection of a saved BBC Repton 3 screen file. The data loads into memory at &31E0 and is &2620 bytes long.

The first 256 bytes consist of miscellaneous data such as passwords, edit codes and VDU19 logical colour definitions.

The screens start at &32E0 and finish at &3FFF, a length of &D20. They run consecutively, each being &1A4 bytes long. For instance, to save screen three just calculate its start address as (31)*&1A4+&32E0=3628 and type:

```
*SAVE screen 3628 +1A4
```

Saving screen seven is just as easy:

```
*SAVE screen 3CB8 +1A4
```

where &3CB8 is (7-1)*&1A4+&32E0. Therefore, to transfer a complete set of screens without the character set from file1 to file2, proceed as follows:

```
*LOAD file1
*SAVE screen 32E0 +D20
*LOAD file2
*LOAD screen
```

then

```
*SAVE file2 31E0 +2620
```

The remainder of the data consists of the character set, starting at &4000 and finishing at &57FF, just below the start of the MODE 5 screen.

The 48 characters take up 128 (&80) bytes each, and are arranged as shown in the screen editor layout – left to right, top to bottom.

The first character (boulder) starts at &4000 and finishes at &407F. The last (broken egg) starts at &5780 and finishes at &57FF.

If you want to save just the time bomb (the 28th character) calculate its address as (281)*&80+&4000=&4D80 and type:

```
*SAVE char 4D80 +80
```

This saves the time bomb to a blank tape or disc.

It can then be reloaded over another datafile – or even another character in the same file – by proceeding as described for saving screens.

All the foregoing can be used with either tape or disc versions, since datafiles saved from each are identical. I'm expecting to see some very professional-looking screens!

The MindMaster – hints and pokes

Darryl Still of Audiogenic writes:

For openers, take note of these three general tips:

- Hidden in the maze are two food pellets; each will restore your energy to maximum. You certainly need them as contact with anything that moves will rapidly drain your energy.
- If you stand in the centre of lift tubes (usually marked with an up-arrow) you will be drawn up into them, although you may have to jump to get into some of them.
- You can carry only one object at a time but try always to carry something. Its easy to bypass objects and spend all your time going from one end of the map to the other.

Now some specifics. Take the first Key from cave 3-9 and use it to open the doors at the top of the first lift shaft. If you don't do this you can't get anywhere.

Give the Program Disc to the Blankoid; in return he will give you the key to open the door in 9-6.

On being given the Comedy Video, the Miseroid will give you a Ten Credit Coin that can be presented to the Bank Terminal to get a Credit Card. Melt this in the Laser Point and you have the Plastic Key that opens the door in 10-6.

The Tailoroid will exchange the Pattern for the Extinguisher: Use it to put out the flames in the far left-hand caves. You can actually walk through the flames, but you lose so much energy that you have little chance of finishing the game.

Use the Spade to dig in the soil; at the bottom of this set of caves you will find a Peace Sign. Take it to the Alien who will give you the Strange Acid. This will destroy the four robots in 5-2. Take the Keycard and open the door in 2-0.

Give the Blunt Block to the Sanderoid in exchange for a Pin: Use it to burst a Balloon in the far right-hand caves. Use the Drill to get by the rock blocking your way into these caves.

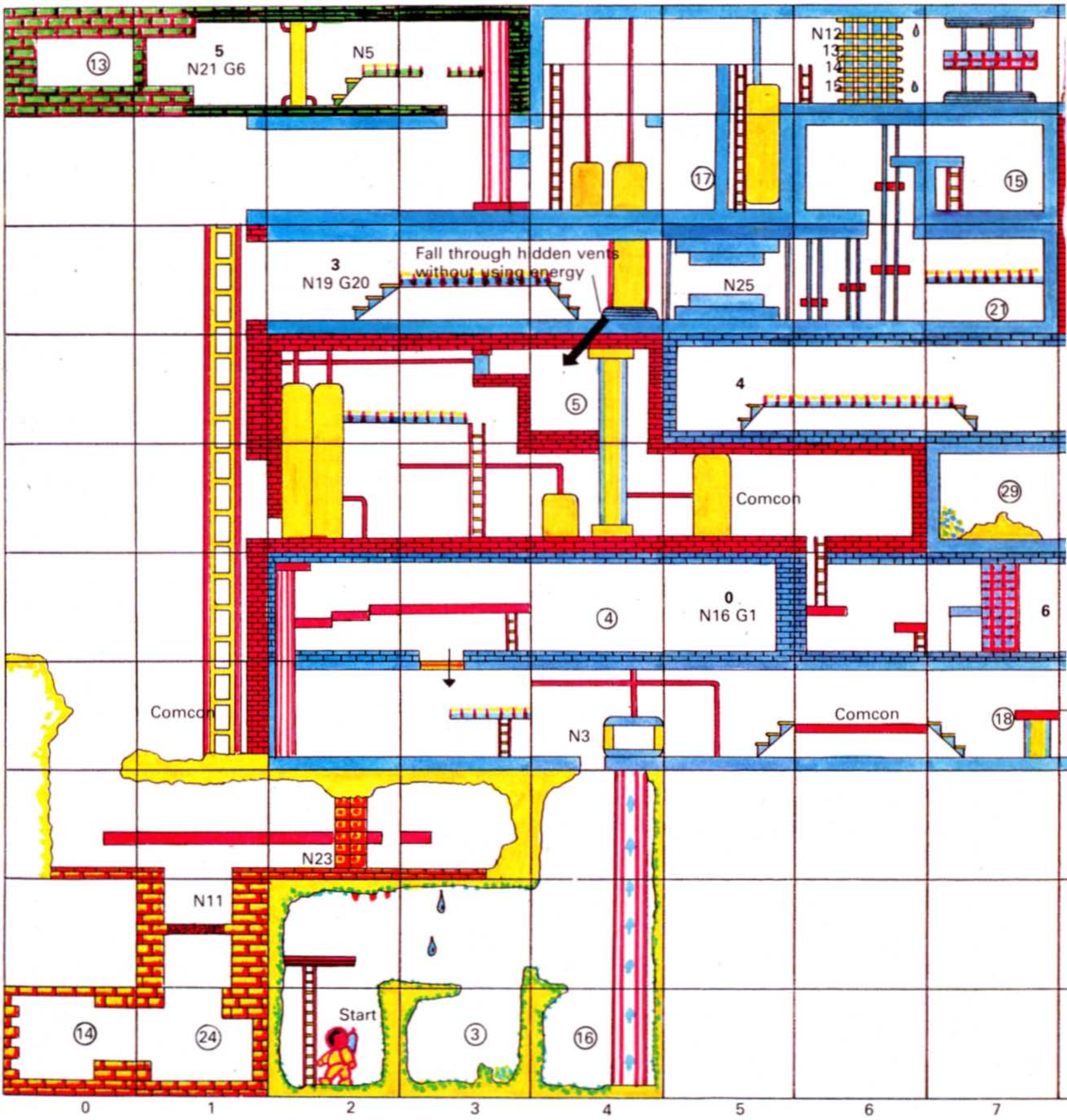
Use the four securi-passes to destroy the four solid pipes. You only actually need the fourth pass, but having all four will increase your score. Be careful with the pipes as they have a nasty habit of reappearing. Use the passes in numerical order and you'll be okay.

Give the ID card to the Securoid, who will give you the Passcard, your entry ticket – through the door in 15-2 – to the final part of the game.

Go to the room with the trap door and break it with the Weight. Take the Key lying beside the Blankoid and open the sixth and last door.

Use the Ramp Control to raise the platform, then take the Hammer. Use it to smash the glass door in 8-4. Get the four parts of the Deacti-Unit and assemble them in the MindMaster's room.

Destroy him to complete the game. Now turn to the map on Page 50.


13
5
N21 G6
N5
N12
13
14
15
17
15
3
N19 G20
Fall through hidden vents without using energy
N25
21
5
4
Comcon
29
0
N16 G1
4
6
Comcon
N3
Comcon
18
N23
N11
Start
14
24
3
16
0
1
2
3
4
5
6
7

Objects shown as (No.) N: Need G: Gives

0: Passcard
1: Key
2: Plastic key
3: Key
4: Key
5: Keycard
6: Pin
7: Ramp Control

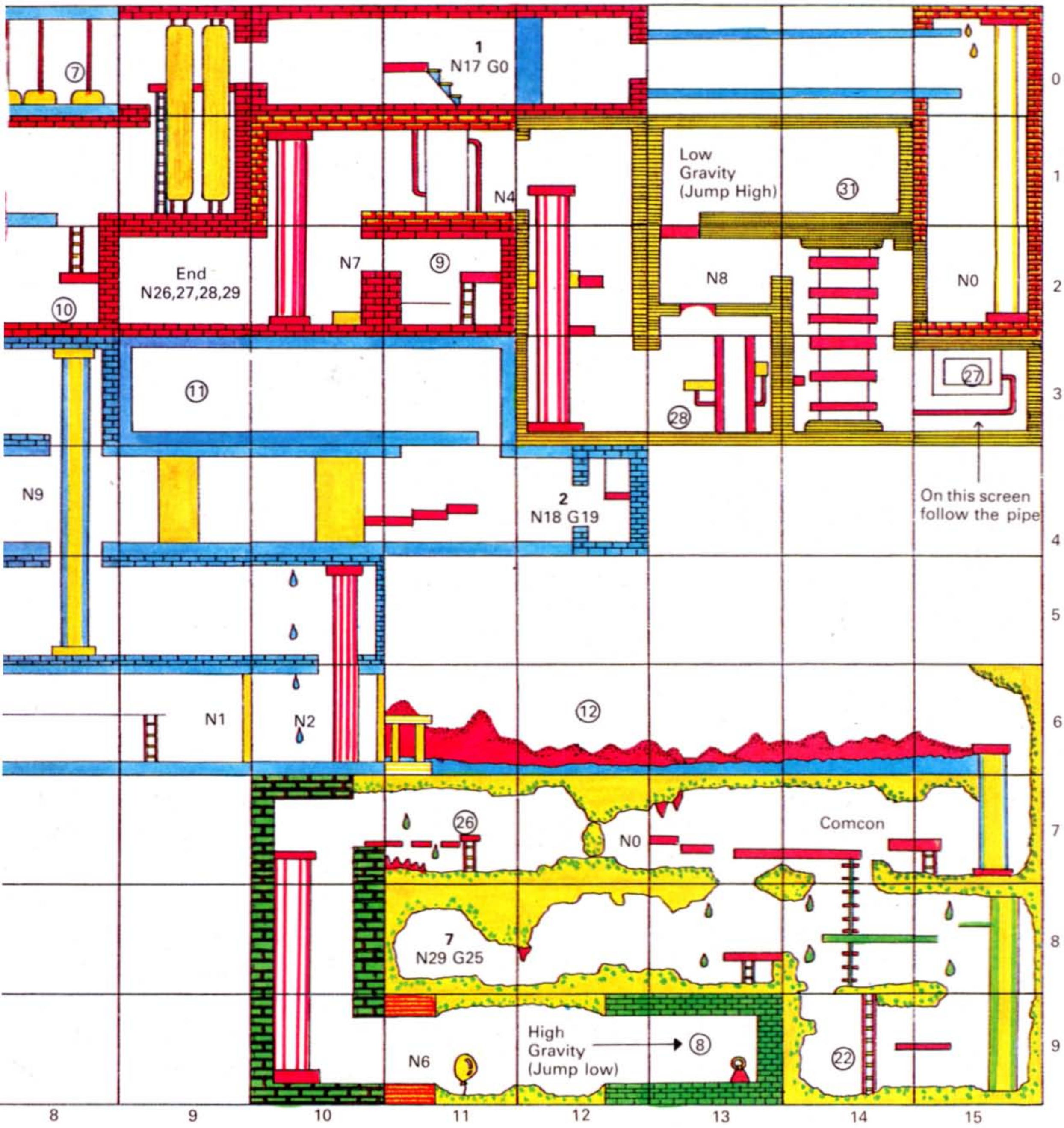
8: Weight
9: Hammer
10: Drill
11: Spade
12:
13:
14:
15:
Shift Pipes (1-4)

16: Disc
17: ID card
18: Video
19: 10 Credit coin
20: Plastic card
21: Blunt block
22: Patterns
23: Flameproofs

24: Peace sign
25: Acid
26:
27:
28:
29:
4 modules of Deacti-unit
30:
31:
Food

CHARACTERS

0: Blankoid
1: Securoid
2: Miseroid
3: Bank Terminal
4: Laser Point
5: Sanderoid
6: Tailoroid
7: Alien


⑦
1
N17 G0
N4
Low Gravity (Jump High)
㉛
End
N26,27,28,29
N7
⑨
N8
N0
⑩
⑪
㉘
㉗
N9
2
N18 G19
On this screen follow the pipe
N1
N2
⑫
㉖
N0
Comcon
7
N29 G25
High Gravity (Jump low)
⑧
㉒
N6
0
1
2
3
4
5
6
7
8
9
8
9
10
11
12
13
14
15

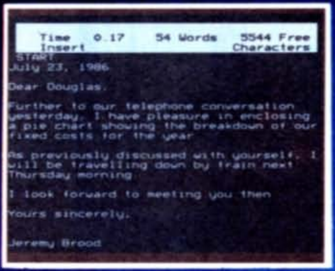
CHEATS

TAPE VERSION: BBC AND ELECTRON
Wind the tape to last file
*LOAD MIND7
!&1B32=&F1D0302
*SAVE MIND7 1B00+AFF
(then load as usual)
DISC VERSION: BBC
*LOAD MASTER
?&2001=49:CALL&1A50

Infinite energy – goes down to death level and sticks there

THE MICRO USER map of
THUNDERSTRUCK 2
The MindMaster

All this in just



```
   Time    0.17     54 Words    5544 Free
   Insert                       Characters
 START
July 23, 1986

Dear Douglas,

Further to our telephone conversation
yesterday, I have pleasure in enclosing
a pie chart showing the breakdown of our
fixed costs for the year

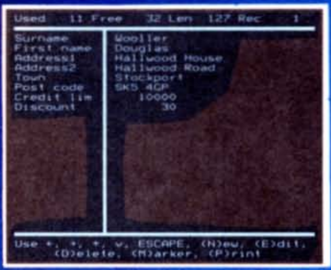
As previously discussed with yourself, I
will be travelling down by train next
Thursday morning

I look forward to meeting you then

Yours sincerely,


Jeremy Brood
```

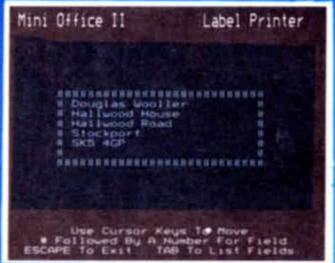
WORD PROCESSOR
Compose a letter, set the print-out options using embedded commands or menus, use the mail merge facility to produce personalised circulars – and more!



```
Used   11 Free   32 Len  127 Rec    1
Surname       Wooller
First name    Douglas
Address1      Hallwood House
Address2      Hallwood Road
Town          Stockport
Post code     SK5 4GP
Credit lim       10000
Discount            30

Use ←, →, ↑, v, ESCAPE, (N)ew, (E)dit,
      (D)elete, (M)arker, (P)rint
```

DATABASE
Build up a versatile card index, use the flexible print out routine, do powerful multi-field sorting, perform all arithmetic functions, link with the word processor – and more!



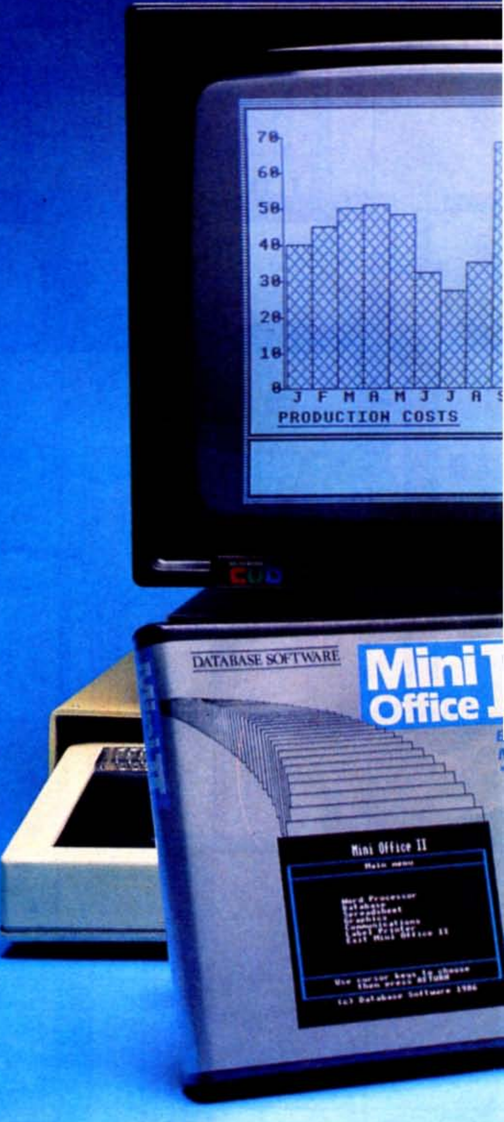
```
Mini Office II              Label Printer



     ################################
     # Douglas Wooller              #
     # Hallwood House               #
     # Hallwood Road                #
     # Stockport                    #
     # SK5 4GP                      #
     #                              #
     ################################


       Use Cursor Keys To Move
   # Followed By A Number For Field
ESCAPE To Exit    TAB To List Fields
```

LABEL PRINTER
Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!



...and at a price

Mini Office II is a comprehensive integreated suite of programs setting a new standard in home and business software.

These sample screenshots illustrate just a few of the wide range of features, many of which are usually only available on software costing hundreds of pounds. Most are easily accessed by using cursor keys to move up and down a list of options and pressing Return to select.

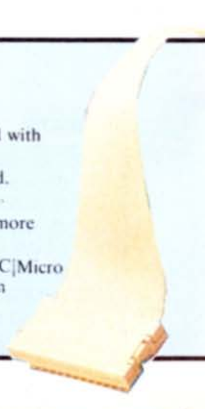
Mini Office II takes over where the original, highly successful Mini Office left off, with numerous extra features, two additional modules, a program to convert existing Mini Office files to Mini Office II format, and a 60 page, easy to follow manual.

And it's at a price everyone can afford!

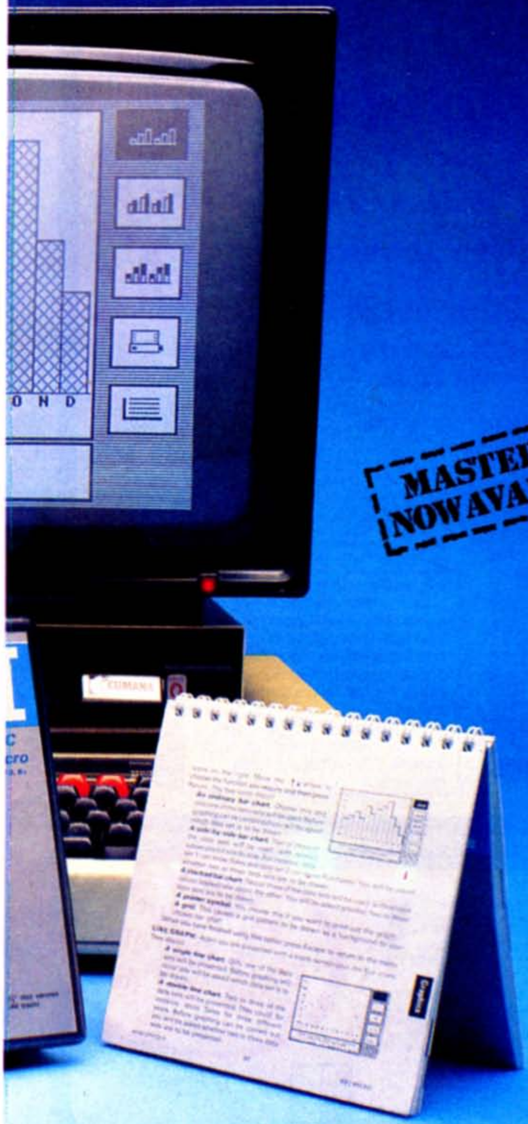
DATABASE SOFTWARE Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY

Now available on a power-packed rom board!

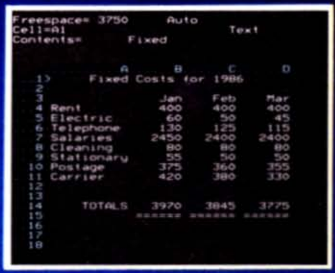
- Four 32k roms on one board packed with 128k of super fast machine code.
- Easy to install – no soldering needed.
- Split second application selection.
- Frees valuable ram space for much more data.
- Fully compatible with the whole BBC|Micro range, Aries or Watford shadow ram board, and tape, DFS, ADFS and ECONET filing systems.



ONE package!



SPREADSHEET
Prepare budgets or tables, total columns or rows with ease, copy formulae absolutely or relatively, view in either 40 or 80 column modes, recalculate automatically – and more!

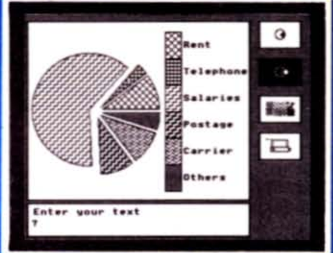


```
Freespace= 3750      Auto
Cell=A1                        Text
Contents=         Fixed


                 A         B         C         D
   1>        Fixed Costs for 1986
   2
   3                      Jan       Feb       Mar
   4 Rent                 400       400       400
   5 Electric              60        50        45
   6 Telephone            130       125       115
   7 Salaries            2450      2400      2400
   8 Cleaning              80        80        80
   9 Stationary            55        50        50
  10 Postage              375       360       355
  11 Carrier              420       380       330
  12
  13
  14       TOTALS        3970      3845      3775
  15                   ====== ====== ======
  16
  17
  18
```

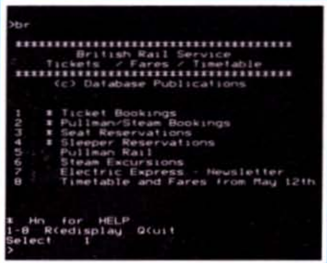
MASTER DISC
NOW AVAILABLE

GRAPHICS
Enter data directly or load data from the spreadsheet, produce pie charts, display bar charts side by side or stacked, overlay line graphs – and more!



```
Enter your text
?
```

COMMS MODULE
Using a modem you can access services such as MicroLink and book rail or theatre tickets, send electronic mail, telex and telemessages in a flash – and more!



```
>br

 ****************************************
          British Rail Service
     Tickets  / Fares / Timetable
 ****************************************
       (c) Database Publications


 1    * Ticket Bookings
 2    * Pullman/Steam Bookings
 3    * Seat Reservations
 4    * Sleeper Reservations
 5      Pullman Rail
 6      Steam Excursions
 7      Electric Express - Newsletter
 8      Timetable and Fares from May 12th

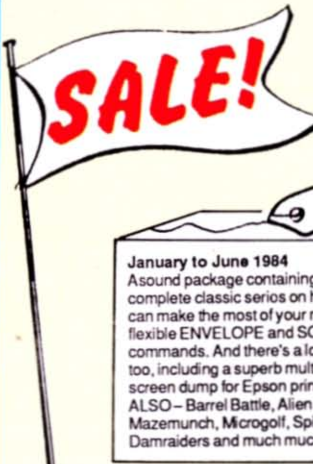

*  Hn  for  HELP
1-8  R(edisplay  Q(uit
Select    1
>
```

that can't be matched!

INSTANT Mini Office II

Mini Office II	
BBC B, B+	
Cassette	£14.95
5¼" disc	£16.95
MASTER	
5¼" disc	£19.95
COMPACT	
3½" disc	£21.95
INSTANT MINI OFFICE II	
On rom for full BBC range	£59.95

Turn to order form on Page 167



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ALSO – Barrel Battle, Alien Invasion, Mazemunch, Microgolf, Spiro, Damraiders and much much more.

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July to December 1984
Gather a fantastic collection of games from action packed arcade action – Doomrun, Villians – to strategy – Backgammon, Rollerball – to adventure – Castle of Fear. You'll find something here for all games fans.
ALSO – Function key editor, Teletext editor and dump, Split screens, 6502 second processor, fast circles and much much more

Bundle 3 6 issues

January to June 1985
Learn to write Machine Code games with a super series that forms an essintial complement to the one in this issue. The package also includes a powerful disassembler and plenty of useful tips for the machine code programmer.
ALSO – Rover, Palace of Carral, Astromines, Mornington Cresent, X-15, Steller Rescue, Othello and much much more.

Bundle 4 6 issues

July to December 1985
Lot's of fun with graphics including a review of the Acorn Graphics Extension Rom, utilities for screen scrolling and three new extra Modes, And how you can obtain superb effects with your micro connected to a video.
ALSO – Draughts, Harbour Command, Great Balls of Fire, Solitaire, Gloop Gulp and much much more.

Latest monthly tapes & discs

FEBRUARY 1987: Rhondo, a fast-action shooting gallery spectacular. 6502 Games, a demonstration of collision detection routines. Choice, develop your childs decision making skills. Map test, grid reference game Date Stamp, save time when filing. List Hold, stop that scrolling screen. Wordwise Plus Index, indexing plus file description. Compressor, variable name compactor. Body Building, super fast A to D converter and multi channel oscilloscope. *Plus Save a life, the life-saving tutorial.*

MARCH 1987: Dino, ride the gobblosaurus in this prehistoric romp. Birthday Mystery, discover the implement of a serious crime. Half-Life, a radioactive random decay simulation. Compressor II, create multi-statement lines. Teletext Carousel, a utility for the Morley Teletext Adapter. Hac Man, the Jet Set Willy II Upgrade. Command Clashes, rom problem solved. Body Building, software for temperature measurement. 6502 Games, collision detection demonstration. Library, three useful routines.

APRIL 1987: Hunkie Egg, collect the eggs in our fast action Easter game. Biomorphs, create creatures with this fascinating simulation. Disc Protection, a utility to stop disc piracy. Counting, the program for the DIY keyboard. 6502 Games, make your sprites follow the leader. *Plus four more routines from the Library.*

MAY 1987: Ducks Dinner, help Daffy Duck get his dinner and avoid the poison skulls. Ludo, an excellent implementation of the popular family game. Interactive Programs, incorporate the wealth of teletext into your programs. Disc Cataloguer, find misplaced files fast. Sid and the Beetle, a simple teaching aid for logical thinking. 6502 Games, programs to get sprites moving in a window. *Plus four more routines from the Library.*

JUNE 1987: Prof McBrolly, pit your wits against the goblins in this race against time. Checksums, type in listings in confidence. Raglan, design your own patterns to any size. Prommer, run your own programs from rom. Button, double the firepower of your Compact. Cansim, a Canadian agricultural simulation. Body Building, the software to drive your video digitiser. *Plus four more routines from the Library.*

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TO ORDER TURN TO THE FORM ON PAGE 167

Your technical questions answered by MIKE COOK

PROBLEM SOLVED

Pixels and resolution

COULD you explain what is meant by pixel when specifying monitor resolution? I am a bit confused as the same monitor, a Microvitec 1431, is described as standard resolution and high resolution by different suppliers.

Also, what is meant by bandwidth? And is the RGB output from the BBC Micro analogue?

I want to know this as I have a digital monitor for an IBM PC and I am told it will not work with the BBC Micro. – **Mr S. Cannon, Geneva, Switzerland.**

● *The Microvitec 1431 is a monitor with a standard resolution of 453 pixels. This means you can see 453 pixels in the X direction, as there are that many phosphor dot triplets across the screen.*

If you display a Mode 0 screen you will not see all the dots and the picture will look slightly fuzzy. It is a bit of a waste going to a high resolution colour monitor for the BBC Micro as the colour display in Mode 0 is limited.

The important parameter is the phosphor dot pitch, which is the distance between the dots; 0.43 is considered to be medium resolution and 0.31 is high.

Bandwidth gives an idea about the maximum frequency the monitor circuits can cope with. In the case of a colour monitor this is largly irrelevent as the display tube is the limiting factor. However, for a monochrome monitor it can give an idea of the resolution.

As a rough calculation a Mode 0 screen produces a maximum of 640 dots in a line. In the worst case every dot alternates, on-off-on-off, giving a square wave video signal of 320 cycles. This is output on the monitor in 58 uS so the speed of this signal is about 5MHz.

Now to see a crisp dot you need at least the third harmonic of this signal, if not more, so the minimum bandwidth for a Mode 0 screen should be 15MHz.

The BBC and IBM computers both produce TTL logic outputs, so there is no reason why they should not work. Some IBM monitors are RGBI, where the I is an intensity signal allowing 16 colours to be displayed. Just tie this to 0 or 5 volts.

Chasing the echo

I AM an engineer working on estimating the attenuation coefficient of the ultrasonic echo received after subjecting a human liver to ultrasound.

I need an A/D converter with a sample rate of 10MHz and 8 bits resolution to be interfaced with a BBC Micro so I can store the information on disc. Is it possible to store the RF signal on a video tape recorder without any loss? – **Laila Sheat, Alexandria, Egypt.**

● *You have got yourself a problem. A domestic video recorder would not cope with the bandwidth you require, as they are limited to about 3MHz. I am not sure if you want to look at a 10MHz signal or just look at the peak reading of a 10MHz signal.*

Assuming the latter, it is just about possible, but tricky and expensive. First you need to construct a peak detector to give you a level signal. Then you can feed this into a video flash converter. A 6 bit one such as the CA3300 from RCA will cost about £40 but for an 8 bit one expect to pay around £200.

There is no way the BBC Micro can take in data at this rate, so you will need an intermediate store. The easiest way of doing this, although not the cheapest, is to use a logic analyser to clock-in the data and then have it read it into the BBC through the serial port.

Most low cost analysers can just about run at 10MHz, and with 2k of memory you should get 5mS of data. As you can see, this is a tricky and expensive operation – no low cost computer can cope directly with these sorts of requirements.

Opus Challenger

IS there any way I can convert my Opus Challenger to use an Acorn ADFS, using the Challenger disc interface? I don't mind if the ram disc is unable to run. – **A.J.Moore, Huddersfield.**

● *The answer is quite simple – no. The ADFS is designed to use the 1770 chip driving through the disc drive port, whereas the Challenger uses the 1MHz socket.*

Lack of loading

MY standard model B is refusing to load from tape. It loads in part way and then stops with a continuous noise coming from the speaker. The same results are obtained with other people's tape recorders. Can I fix it? – **J.Bream, Dorking.**

● *This could be the –5V from the power supply. However, most likely is the LM324 op-amp situated next to the cassette socket.*

But it is not beyond the bounds of possibility that it is a memory fault or even that the 20MHz crystal controlling the whole computer has gone off frequency.

Without access to the machine I really can't say, so I think you'd better get it properly serviced.

Head alignment

I HAVE twin 40/80 drives, and drive 1 behaves as if its head were not aligned properly. That is discs formatted on drive 0 cannot be read on drive 1 and vice versa.

I returned them to Watford, who assured me that they worked perfectly. Unfortunately the problem persists. Could it be the disc interface?

And now drive 0 has begun to have difficulty reading discs, continuously giving the

```
Track 0 not found
```

error, the only cure being to open the drive case and return the heads to track 0. – **J. Ball, Sheffield.**

● *It is difficult to know without seeing the drives but I am sure the problem is one of head alignment and not one of the interface. It sounds like the positioning of the track zero micro switch.*

You do not say if the discs you are having trouble with were formatted before or after the drives went away. If before, then they could have been adjusted and so your old discs will not be right.

Make sure, however, that you only have one terminating resistor pack in your two drives, as having a pack in each drive can cause trouble.

No saving grace

I AM the owner of a BBC Model B OS 1.20 computer. It has recently and suddenly developed a fault. Namely I cannot save a program from it on to tape.

When an attempt is made it goes through the motions as far as visual indication on the monitor, but the only sound is a continuous tone, level at about 500Hz. When saving is complete a normal prompt and bleep is given, but on the tape there is only the continuous tone and no programs.

I have tried several tape recorders to no avail, and I wonder if this is something of which you have had previous experience or could put a finger on?

I should be most grateful for your comments. – **Cyril Smith, Guildford.**

● *I am a little puzzled at the tone frequency you report because 500Hz is not a tone that is normally produced. If you mean 50Hz (mains hum) then the output operational amplifier has gone. This is an LM324 and is to be found next to the analogue input port.*

Sometimes this is in a socket but if it is soldered in cut it out with some side cutters then remove the pins one at a time. Solder a socket in its place and replace the chip.

If, however, the sound is 1200 or 2400Hz (a high pitch tone normally found on the tapes) then the output amplifiers are okay and your problem will be in either the serial ULA or the 6850 ACIA.

One way you could narrow it down is to see if the RS432 serial interface is working. This uses part of the ULA and the 6850 so if it is okay the problem must be in the part of the serial ULA used to handle the cassette recorder.

In Part 4 of his series
Trevor Roberts looks
deeper into pseudocodes

Bringing choice to pseudocode

IN our explorations of pseudocode, we've come across two kinds of statement structure. The first is sequence, which is simply what happens when one statement follows another.

We used this to explore how we could break down an action into simpler actions or our algorithms into a series of mini-algorithms. The idea was to divide one large task into a number of subtasks. These, hopefully, would be easier to deal with, than doing it all as one job lot.

In a way it's looking at the wood a tree at a time. The motto we followed was never to do in one mini-algorithm what can be put off until another.

The second category of statements came about when we wanted to repeat a section of code a certain number of times. The first method we came across was the FOR...DO statement. This specifies the number of times the body of the loop is to be performed. Both Basic and Pascal have this type of control structure, known as a deterministic loop.

Sometimes we don't know the number of times the loop is to be performed, only the conditions that will bring it to an end. For this case we learnt about the iterative loops, REPEAT...UNTIL and WHILE...DO. Pascal has both types of structure, the various types of Basics having both, one or neither of them.

As we've seen over the last three months, we can do quite a lot with these pseudocode structures. This month we're going to add one more to complete the set, the IF construct.

If you think about it, all the pseudocode we've looked at so far has one thing in common. Whether it consisted of just a simple sequence of statements, a more complex structure of mini-algorithms, a set of loops or a mixture of all of them, there was one common factor: All the statements were performed. There was no choice. If a statement was there, it got executed.

The IF statement brings choice to pseudocode, allowing a statement to be executed or not depending on circumstances.

This decision making capacity is what gives our algorithms their power. A bank might want a program to pay out a cheque *if* there is enough money in an account. A game might let you have another go *if* you have a life left or open the door to the treasure trove *if* you have a key.

The pseudocode IF structure is:

```
IF condition true DO
   perform action
ENDIF
```

a construct that should be familiar from most programming languages you may have met. What the conditions are is up to you. They can be simple – if over 65 – or complex – if tall, dark and handsome. Just remember that you've got to keep track of it all when you come to write your program.

Should the condition be true, the algorithm goes on to perform the action sandwiched between the DO and the ENDIF. So if the IFs were:

```
if over 65 do
   calculate pension
endif
```

or:

```
if tall, dark and handsome do
   say 'Hello, good-looking'
endif
```

and the respective conditions were true, then the algorithms would calculate the pension, or make a pass, as required.

As with our loops, there can be more than one statement depending on the IF, as:

```
if condition true do
   perform action
   perform another action/s
endif
```

shows. No matter how many there are, the algorithm only performs them if the condition is true. If it isn't they're ignored.

Looking at our example IFs, this means that if the test wasn't true – the person being tested was only 64 or was short, blond and ugly – then nothing happens. That bit of pseudocode is ignored and the algorithm goes on to look at the next statement after the ENDIF.

This is fine and good, but sometimes we want to specify an alternative action. We might want a program to pay a cheque if there is money in the account or, if there isn't, to issue a warning.

We might want a game to give us another go if we have a life left or, if we haven't, to offer us a chance to start again.

It's often the case that we want our algorithms to reflect the other side of the IF. If the condition is true, then we want it to perform one action, or else, if the condition isn't true, we want the algorithm to perform an alternative action.

This is dealt with in pseudocode with the:

```
IF condition true DO
   perform action/s
ELSE
   perform alternative action/s
ENDIF
```

construct. Now if the condition is true, the action or actions between the DO and the ELSE are performed. If the condition isn't true, the alternative course of action – specified between the ELSE and the ENDIF – is taken. Either way, one or the other alternatives is chosen.

Using this, our previous examples might become:

```
if over 65 do
   calculate pension
else
   calculate wage
endif
```

or

```
if tall, dark and handsome do
   say 'Hello, good-looking'
else
   think 'beggars can't be choosers'
   say 'Hello, good-looking'
endif
```

depending on which alternatives you want.

Incidentally, our pension example is decidedly sexist. What if it's a woman who, being the object of discrimination, retires five years earlier than men? Figure I shows one way of dealing with this.

BEGGARS CAN'T BE CHOOSERS
HELLO GOOD-LOOKING
Yoo-Hoo!

Can you keep track of the IFs? Might it be better if the first IF called a mini-algorithm which dealt with the second IF?

```
if male then
   if over 65 do
      calculate pension
   else
      calculate wage
   endif
else
   if over 60 do
      calculate pension
   else
      calculate wage
   endif
endif
```

Figure I: A non-sexist algorithm

While you're with Figure I, can you alter the algorithm so that it does the same job, but only calls:

```
calculate wage
```

once? Try it and see. You'll find that there's often more than one algorithm to perform a task. Your role is to pick the most suitable for the job in hand, which isn't necessarily always the first that you think of.

Figures II and III give two more examples of the IF construct in action. Notice that in Figure II the action taken if the condition is true – the pub is open – is a loop. Maybe it could be a mini-algorithm.

```
if pub open do
   while pub open do
      go to bar
      buy drink
      consume drink
   endwhile
else
   find an off-licence
endif
```

Figure II: An alcoholic algorithm

Now our editor has an alternative to the pub – finding an off-licence. The algorithm in Figure III, while dealing with a more realistic situation, is exactly the same in structure, only the details are different.

```
if data left
   while not end of file do
      read next item
      process item
   endwhile
else
   write data finished
   close all files
endif
```

Figure III: An algorithm for your files

And that is where we come to the end of this brief introduction to pseudocode. With the structures we've already dealt with – sequence, repetition and selection – you can write almost any algorithm.

And after you've thought about it and written it you can then code it. Figure IV summarises the constructs we've covered.

```
FOR a number of times DO
   perform action/s
ENDFOR

WHILE condition/s is true DO
   perform action/s
ENDWHILE

REPEAT
   peform action/s
UNTIL condition/s is true

IF condition/s true DO
   perform action/s
ENDIF

IF condition/s true DO
   perform action/s
ELSE
   perform alternative action/s
ENDIF
```

Figure IV: Pseudocode structures

From what I've written you'll see that I'm an advocate of pseudocode. Not everyone is, though most of those who don't like it have never tried it.

As an experiment, try designing, writing and testing your programs in pseudocode before you sit down at a keyboard and start entering Basic or Pascal statements. I'm sure that you'll be surprised at how a little thought spent on a pseudocode design saves a lot of time and trouble later.

I think that what I'm trying to say is:

```
while programming do
   design in pseudocode
   if algorithm works do
      translate into code
   endif
endwhile
```

■

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First night at the PROMs

Hugh Haskell presents an easy way to get your programs into rom

PROMMER is a Basic program which allows you to put any type of file – Basic, machine code or even data – into a format suitable for blowing into sideways rom or operating out of sideways ram.

It runs with PAGE at &1900 and leaves a full 16k of ram available for the maximum rom image size. The resulting code can be loaded directly into sideways ram if you have it, or saved on disc for later blowing into rom.

Prommer gives the added advantage that processed Basic programs can be made to load back at any desired PAGE setting, as it is independent of the DFS.

The programs loaded into ram do not run in the sideways rom but are stored there for downloading into user ram in the area for which they were designed.

If one Basic program in rom is to be chained by another, you should change from CHAIN"name" to *NAME in the calling program.

When you run Prommer you will meet a number of screens and input requests.

On the first screen you are asked for the name by which the rom is to be known. Only the first seven characters of the name will be used when saving to disc.

Next comes the rom size. Enter it in kilobytes – 2, ·4, 8 or 16. Almost any number will be accepted, for example entering 3.3k will specify a 4k rom image. Pressing Return gives a default value of 16k.

On the second screen the rom name and its size are displayed in the heading together with the buffer area addresses, and you are asked to supply the name of the first program to be incorporated.

Names follow the usual file name format and you can include drive and directory in the name if you wish. You can enter any star command at this point, but be careful with ones that use memory, such as *COMPACT, as these will corrupt the program.

The next request is for the name for use in rom. This is the star command which will activate your program. Press Return if you want the same name as the disc name, or input a new one. Enter just the name – you don't need the asterisk.

Beware of names like CODE which are system commands or commands for any of your other roms. The program will let you know if you have given the same name to a different program.

If the file is a Basic program you are asked for the PAGE setting. Press Return for PAGE to be left at whatever value it has at the moment when the program is activated, or type a hexadecimal number (without the ampersand) to force PAGE to a different value. A value less than 1900 will cause *TAPE to be selected when the program is called.

For non-Basic files you have the choice of simply *LOADing or *RUNning them.

Barring errors, these prompts will be repeated until either you have entered all your programs, you run out of space or you have loaded 16 programs – the maximum allowed in the rom catalog.

When you have entered all your programs press Return at the file name prompt to end this phase.

Prommer now begins to build the rom, and you will see the program list for your rom as it is built up from the files you have named.

The table shows the name by which the program will be called from rom, its name on the disc and the corresponding PAGE setting if a Basic program, or that it is machine code.

If Prommer cannot find a named program on the current or specified drive an error message is displayed and you can change discs as required.

When this phase ends the message Load to ram Y/N? appears and if you have sideways ram you can now load the code. But this option will work only if your sideways ram is always accessible by writing. If it isn't, you should save the rom image and load it using the commands applicable to your system.

This is followed by Save to disc Y/N? which allows you to file the image on disc for later use. If you select Y here you can also make further copies on other discs. When you have replied N to the last question the program ends.

If you have loaded sideways ram, press Break to activate your new rom (Control+Break for Master and Compact). Type *H.name, where name is the name you have given to the rom, or an abbreviation for it (no full stop required), and the list of programs is displayed. You can call any of them using *NAME, and in this case use the name in full or an abbreviation ending with a full stop.

And there you have it, the easy way to get your programs into rom. But be careful not to make any errors when typing star commands, because a Basic program may overwrite another already in memory – and they load very quickly out of sideways ram so you can't change your mind.

```
   10 REM PROMMER v 1.0
   20 REM for BBC & Master
   30 REM by Hugh Haskell
   40 REM (c) 1987 The Micro User
   50 MODE7:IF PAGE<>&5900 THENPAGE=&590
0:CHAIN"PROMMER"
   60 ONERRORVDU26:PROCer2:END
   70 PROCinit:PROCscr1:PROCrom
   80 PROCsize:PROChdr:H%=P%-C%
   90 PROCscr2:I%=0:PROCfname
  100 IFI%<0 END ELSEIFI%>1 PROCsort
  110 FORB%=0TO2STEP2:P%=C%
  120 PROChdr:PROClist:NEXT
  130 PROCscr3:PROCgfiles:PROCclear
  140 ONERROR PROCer1:GOTO 150
  150 IF FNy("Save to disk  ") PROCsave
ELSE GOTO170
  160 IF FNy("Further copies")THEN150
  170 IF NOT saved END
  180 IF FNy("Load to S/W RAM") PROCram
  190 END
  200 DEFPROCinit:saved=FALSE
  210 B%=0:G%=&FFFF:K%=&FFE3:M%=&FFE7:T%
=&FFF4
  220 DIMNm$(15),Ln%(15),Ad%(15),DNm$(15
),p%(15),Ld%(15),Xq%(15)
  230 A%=&83:C%=(USR(T%) DIV 256) AND &F
F00:S%=&900:O%=&8000-C%
  240 master= (253=INKEY-256):ENDPROC
  250 DEFPROCer1
  260 IF ERR=190 OR ERR=195 OR ERR=198 O
R ERR=201 THEN290
  270 DEFPROCer2
  280 REPORT:PRINT" at line ";ERL:END
  290 CLS:REPORT:VDU7:A=INKEY(200):CLS:E
NDPROC
  300 DEFPROClist:[OPTB%:.hdg
  310 OPT FNs("   Program List")
```

Mike Cook takes a look at the Acorn RISC factor

RI

Fast-forwar in

THERE is a new buzz word about: RISC. The initials stand for Reduced Instruction Set Computer. But what does it mean and what impact will it have on the world of personal computers?

Well, like most things RISC is not that new. Work started on the philosophy behind it way back in 1975 with an IBM research project. This work was later picked up by Stanford and Berkeley University and, totally independently, by the researchers at Acorn in 1983.

While the Americans worked on a 16 bit machine, Acorn went straight to a 32 bit data bus which allows four bytes to be read in simultaneously.

To understand the philosophy of RISC you first need to look at the development of conventional processors. Once the initial hurdle of getting a microprocessor on a single chip was overcome, its development has been one of ever-increasing complexity. But as the chips get bigger the manufacturing yield gets smaller and so the price increases.

It seems that increasing complexity in instruction sets was introduced because it was thought that it produced a more powerful processor – but no research was actually done into how useful all these extra bells and whistles were.

When a microprocessor fetches an instruction it has to be decoded. And that means that the bits of the instruction have to activate various internal components and systems.

For example, an addition operation has to activate the parallel adder and then move the result back to the register. In the simple early processors these operations would be invoked when the proper bit pattern in the instruction appeared.

But in the modern, more-complex processors the actions are controlled by what is known as micro-code, which is actually a set of instructions similar to a computer program written by you. So when a particular bit pattern appears in an instruction, a sequence of micro-coded instructions is carried out, perhaps involving branches and loops within the instruction.

The micro-code is stored in a rom on the chip and forms part of the microprocessor. As instruction sets become more complex this rom takes up an increasingly greater proportion of the chip.

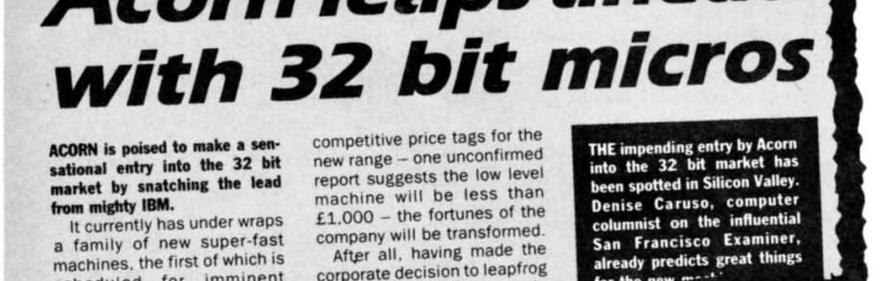
What makes matters worse is that when you analyse some of the more complex micro-code it is actually quicker to perform the same operation as a sequence of simpler operations. Couple this to the fact that the more complex operations are very infrequently used and you realise that a lot of the chip's area is going to waste.

Not only that, but when the code written with complex instruction sets was analysed it was found that programmers often used only a subset of the possible instructions.

Any chain is only as strong as its weakest link, and a processor is only as fast as its longest instruction. If you have an instruction that activates a lot of components the instruction cycle will have to be long enough to allow all the components to respond, which means that for the less complex instruction there will be some dead time in the cycle.

So, by eliminating the complex instructions it is possible to speed up the simpler ones, the space saved on the chip can be put to better use, and most programmers don't notice the loss because they didn't use the instructions anyway.

The next step in speeding up the processor is Pipelining. This is a tech-



Acorn leaps ahead with 32 bit micros

ACORN is poised to make a sensational entry into the 32 bit market by snatching the lead from mighty IBM.

It currently has under wraps a family of new super-fast machines, the first of which is scheduled for imminent competitive price tags for the new range – one unconfirmed report suggests the low level machine will be less than £1,000 – the fortunes of the company will be transformed.

After all, having made the corporate decision to leapfrog

THE impending entry by Acorn into the 32 bit market has been spotted in Silicon Valley. Denise Caruso, computer columnist on the influential San Francisco Examiner, already predicts great things

What RISC means for Acorn – a passport to the new generation of 32 bit computers. See the full story on Page 7.

SC
d to the future

nique of fetching the next instruction while the previous one is being decoded and executed. Without pipelining the processor is idle while an instruction is being fetched from memory and the bus to the memory is idle while the instruction is being executed.

With pipelining the next instruction is being fetched while the last instruction is being executed – in the ideal situation this can double your speed.

```
IF
Test condition
If test has failed jump to ELSE clause

THEN
Instruction(s) if test passed
Jump over the ELSE clause to Continue

ELSE
Instruction(s) if test failed

Continue
Rest of program
```

Table I: The conventional code for an IF ... THEN ... ELSE sequence

```
Test condition

Instruction(s) on condition true

Instruction(s) on condition false

Rest of program
```

Table II: The equivalent Acorn RISC code

But there is a problem: Branches. If the instruction you are currently executing is a branch backwards or forwards then the instruction waiting to be executed will not be the one needed, thus negating the advantages of pipelining.

To avoid this problem the Stanford team utilises what is called delayed branching, where the branch does not take effect until the instruction after the branch instruction. This can be quite messy to program and the Acorn team adopted another approach.

They sidestepped the problem very adroitly by making branching an infrequent operation, using the radical step of making all instructions conditional.

Often branches are small jumps forward to skip a piece of code, so in the RISC each 32 bit instruction has a 4 bit condition field which allows for 16 different conditions to be specified. The result is that branching becomes necessary only for loops and long jumps. Take the IF ... THEN ... ELSE examples in Table I and Table II.

Conventionally this will involve a test, a conditional branch and an unconditional branch. With RISC conditional instructions the branches are not necessary.

Another activity that takes time is accessing memory locations for storing variables, necessary because of the limited number of on-chip registers. In the 6502 there are just three registers, an accumulator and two index registers, but the RISC chips have many more. In the Acorn chip there are 27 registers although only 16 can be seen at any one time.

All operations are specified between registers. There are two source and one destination register for each instruction. One of the source registers can be sent through a barrel shifter first to premultiply it. This allows some multiplication functions to be done at the speed of an add instruction.

There is a specific multiply instruction and this is the longest instruction in the chip, taking 16 cycles. This might at first seem to go against the RISC philosophy but there is another instruction that dumps all the registers to memory. And as there are 16 registers this also takes 16 cycles.

All the conventional operations such as AND, OR, Exclusive OR, add, subtract and shift are there, as well as a versatile set of block move instructions.

What you will miss from a conventional instruction set is the memory addressing modes – in the Acorn RISC there is only one. It is *Program Counter Relative with Register Offset*, which means that the address for memory access is always relative to the next instruction. This is indicated by the program counter (register 15), plus an offset provided by the offset register, R14, or the branch link register. The only other special register is R13, which is used as a stack pointer.

Using this addressing mode all the modes from any other processor can be simulated and in theory it is possible to simulate the action of any microprocessor using the RISC chip.

Also, this addressing mode enables position independent code to be written quite easily. This is important in multitasking systems where it is not always possible to know in advance where in memory the code is going to be run.

As I said, the programmer only sees 16 registers so where do the other 11 registers go? Well, the RISC chip can run in four different modes – User, Supervisor, Interrupt and Fast interrupt.

When changing from one mode to another some of your 16 registers change so there is no need to save registers on the stack or in memory as in

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◀ From Page 61

conventional machines. Typically an application (such as a language, spreadsheet or word processor) would run in the User mode.

Calls could be made from this to the operating system which would run in the Supervisor mode with inputs and outputs being handled in one of the interrupt modes. This is already what happens in the BBC Micro but it is implemented in software. With the RISC chip there is hardware support for these operations.

You have all registers R0 to R15 available in the User mode. When you change to the Supervisor mode R13 and R14 are switched to be different registers. When you return to the user mode the original values you see in R13 and R14 are restored. The same thing happens in the Interrupt mode, whereas in the Fast interrupt mode seven registers R8 to R14 get switched in.

There are also special instructions to let two or more RISC chips talk to each other, allowing the rapid transfer of instructions and data. This makes it possible to construct multi-processor machines that interact at the lowest possible level.

The Acorn RISC chip is a word-addressed 32 bit processor. However, the top eight bits of the program counter also double as the status register, so only 24 bits of it are brought out on to the bus. But as four bytes are fetched at a time the two least significant bits need not be specified, so in effect it can address the same amount of memory as an 8 bit machine with a 26 bit data bus.

This is a staggering 64Mb of memory, more than enough to be going on with. Of course most machines won't include nearly as much as that but the potential is there.

> ***‘The time is near when the RISC chip will be available in an affordable micro’***

The basic speed of a processor is measured in millions of instructions per second (mips) although as each instruction takes a different time to execute this is an average.

Some comparisons can be made between different processors. For example, a BBC model B runs at about 0.2 mips; the 68000, used in the Macintosh and Atari ST runs at 2 mips, and the new 68020, used in the Macintosh II will run at a speed of about 4 mips.

There are two versions of the Acorn RISC chip, one using 3 micron technology and the new version using 2 micron technology (that means the size of the smallest element). The old RISC chip can run at 4 mips and the new one is capable of speeds up to 14 mips at a clock speed of 18MHz.

As you can see a computer using the chip would be seven times faster than the fastest micros currently available.

When manufacturing the RISC chip in 2 micron technology it contains about 25,000 devices and occupies a chip size the same as the old 6502. Compare this with the 68020 which contains 192,000 devices and is 10 times bigger. This means that the production yield will be much higher than the more complex 68020 and therefore the new RISC chip should be quite cheap.

So there you have it, the RISC that is well worth taking. The old RISC chip has been available as a second processor evaluation system for the BBC Micro for just over a year now, but at £4000 Acorn has not sold very many. This price reflected the high developmemt costs and the small potential sales but it allowed developers to gain experience using this new system.

The time is near when the RISC chip will be available in an affordable computer and that I can only describe as very exciting. Watch this space! ■

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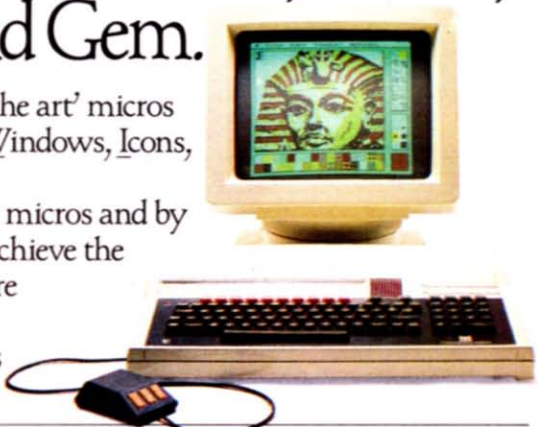

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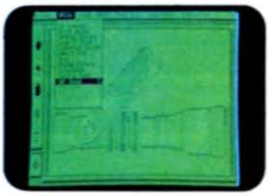

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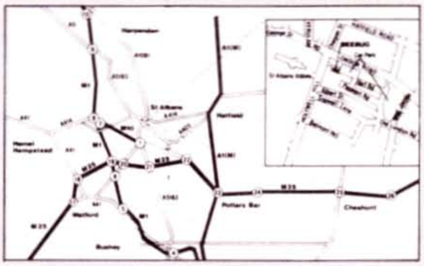

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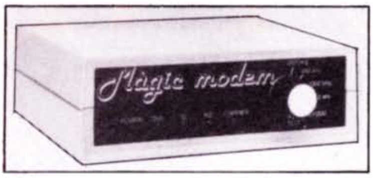

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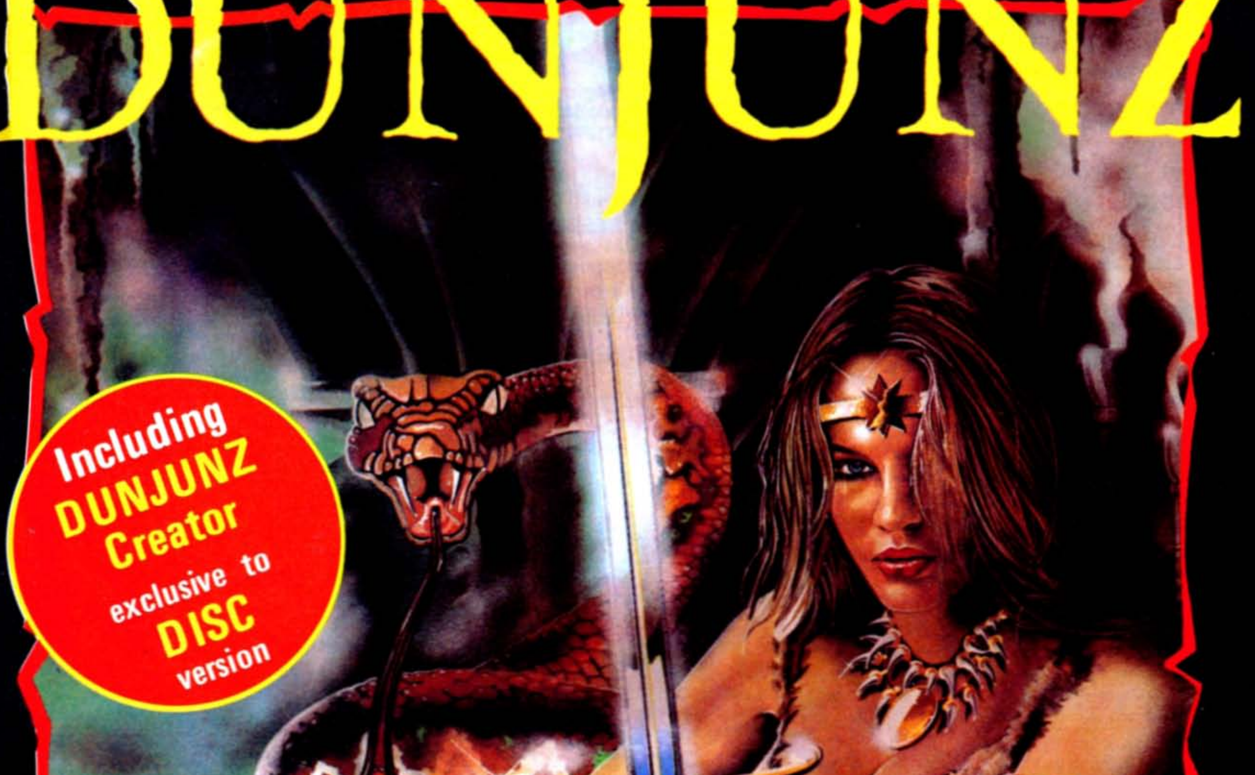
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AN ambitious assault on educational software markets throughout Europe for a variety of machines including the BBC Micro is planned by ex-Acorn boss Chris Curry.

He is leading a group which plans to prepare more than 100 titles for release early next year.

The aim is to produce software with little cultural dependence so that it will be useable across the continent.

The £2 million venture is setting its sights on what is considered to be a £500 million market.

It will serve traditional education and college users plus further education and industrial training.

The targets will be the larger users such as local education authorities, colleges and businesses.

Curry said: "We intend to take educational computing seriously from the software point of view. We will take large quantities of high quality products to the whole of Europe".

It is expected that publishing will be in the form of licensing. The Cambridge-based operation will run under the name of E2S.

The rest of the formidable team is made up of Applied Research founder Ed Hoskins, ex-Acornsoft boss David Johnson-Davies, Computer Aided Design Centre man Tom Sancha, and former director of engineering at Sinclair Research Hugo Davenport.

Reading made easier

WHEN Trude Salisbury's youngest son was nearing eight he couldn't read at all. Today he has 10 O Levels, four A Levels and a university degree under his belt.

He was lucky enough to have a concerned mother willing to study remedial teaching methods and capable of producing a package of learning materials that worked.

The BBC Micro entered schools too late to help her son learn to read, but that hasn't stopped Trude Salisbury putting her methods on disc for the benefit of other children with reading problems.

Children try out Play and Read helped by Trude Salisbury

Her company, Prisma Software, has produced a pair of programs called Play and Read for the BBC Micro and Master 128 at £25 each, and Master Compact at £26 each. These are supported by book and word card sets at £5.45.

Prisma has just released Looking at Words, a program which complements Play and Read by focusing on parts of words.

There are a number of games dealing with beginnings of words, endings, vowels, double letters and vowel combinations.

Each game is progressive, starting with a limited number of words and increasing to the 54 words used in the corresponding Play and Read package.

There are different levels to each game, ranging from the very easy to some challenging puzzles.

Looking at Words costs £12.61 for the BBC Micro and Master 128 and £13.48 for the Master Compact.

To help teachers and parents, Prisma (0244 26244) has produced a report which charts the progress of 11 children who learned with Play and Read over an 18 month period. It costs £1.50.

School video project

A TWO-year £1.5 million Interactive Video in Schools project has been launched by the Department of Trade and Industry. The DTI has funded design and development of eight special discs so that the educational potential of interactive video technology can be assessed.

During the IVIS project the discs will be trialled in 92 schools throughout the UK. Subjects covered are environmental studies, French, geography, design education, primary science, primary in-service training for teachers, practical maths, and social and personal maths.

Teaching German

A NEW three-program German language learning package designed by teachers has been released by Chalksoft. It teaches colours, animal names, phrases used in guiding someone around a town, and telling the time.

Stadtmitte helps pupils learn the correct phrases to direct someone around the centre of a German town with the aid of an on-screen map.

Farben shows the rules and practice for identifying colours and animal names.

Zugspitze is an aid to learning the time, in the form of a race against the clock to the top of a mountain threatened by an avalanche.

The BBC Micro and Master version costs £17.50, and the Compact version £19.80, from Chalksoft (0775 69518).

EDUCATION NEWS

Boys start robotics firm

A GROUP of pupils at Oundle School, Peterborough has set up a limited company to market a robotics control board they designed in their spare time.

The £99 device is a versatile interface for use with all BBC computers and is designed to demonstrate uses of the analogue and user ports.

It controls motors, sensors and binary counters and can be used in conjunction with model construction kits to produce robots and buggies.

If stepper motors are used, devices can be made which operate with precision control, and electronic components can be used with the board to produce various kinds of measuring instruments.

The board will control eight one-way motors or four bi-directional motors or two stepper motors, as well as a combination of these.

In addition, eight digital sensors, four analogue sensors and two debounced counters can be used.

These functions can be doubled by adding an expansion board.

Oundle Edutech is a unique limited company. Although it was set up and is entirely run by the boys of Oundle School – and uses school buildings as its "factory" – it is financially separate from the school.

The managers and chairman are sixth-formers and all members of the company hold a monetary share in Edutech.

The original idea for the company came from a third form robot and buggy building project run by maths teacher Ian Potts in the 1986 summer term.

Lighting control

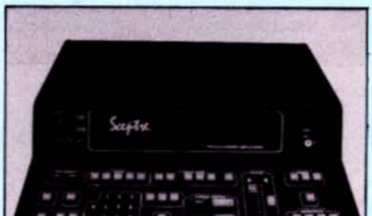
CURTAIN up; light the lights; you've got nothing to hit but the ... buttons of the Sceptre control system.

Eltec has produced a lighting board which runs on a BBC Micro and takes much of the headache out of preparing and executing lighting plots in smaller theatres.

Though designed mainly for schools and colleges, a Sceptre has been installed in the Studio Theatre at Derby Playhouse.

The studio manager there, Andy Falconer, said that even though they knew nothing whatsoever about computers the staff were soon able to work out how to use the board.

"We have a number of visiting amateur and professional companies who use the studio and so it was essential that we had a system which could be picked up very quickly.



"Everyone who has come in to use the system has found it very friendly", he said.

The resident company has also been able to extend its lighting repertoire because the system of recording plots makes it possible, physically, to create more complicated effects.

The system offered by Eltec (069-184 8801) can control up to 120 channels and has disc storage which should take technical details for a number of whole shows, and offers the option of print-outs.

It is also educational, claims the firm, enabling students to learn to use memory systems. A help facility calls up a brief description of the function of particular keys.

Controls enabling manual override and easy change of sequences are included.

The system starts at £999 with extension boards at around £200.

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Transformation in dynamic geometry

Product: Transform
Price: £19.95 (5¼in disc) £22.95 (3½in disc)
Supplier: Chalksoft, PO Box 49, Spalding, Lincs PE11 1NZ.
Tel: 0775 69518

TRANSFORM is designed to help those who wish to learn, or who teach, that section of modern mathematics called transformation geometry.

This unites a number of dynamic geometries and so is sometimes described as motion geometry, as opposed to the old-fashioned traditional geometry based on rigid figures.

In transformation geometry shapes can be rotated, reflected, enlarged or translated and all these functions are possible with this package.

They are effective both at the simple level necessary in the upper classes of the Primary School and certainly at the level required by the new GCSE examinations.

I was impressed when I ran Transform for the first time.

It has been some years since I first used Chalksoft maths programs on tape and there has been a real development in programming techniques, classroom applicability and value for money.

But I did have some "no room" problems with a 1981 version when trying out some tessellations and longer series of transformations.

After loading the two demonstration programs, Simple and Complex, show off some of the possibilities of Transform. These serve as an extended user guide and it really is worthwhile spending some time experimenting with them.

However, I would prefer it if the title of the second one were changed from Complex, to avoid confusion with complex number transformations with which the program was not designed to cope.

These demonstration programs are easy to use and understand and the facility to go back over all the previous steps of the demonstration was especially helpful.

In the classroom they dynamically illustrate the effects of a range of transformations which can be run over and over to emphasise important points and provoke class discussion. It was very convenient to move from image to image as the discussion and questioning demanded. As I worked through the Simple and Complex examples given. I did wish that this facility to regress and re-examine each stage had been built into the main part of the program.

In the main program the shapes to be transformed may be input by simple use of the cursor keys and a pointer on the screen, or by typing in their coordinates.

The actual movements of the shapes on the xy-plane is achieved by use of Shift and function keys – a key-strip is provided – but note that coordinates or matrix elements in the form of vulgar fractions are not accepted: You must use decimals when required.

At this level the program was useful as an early aid to the learning of coordinate geometry. The facility to plot straight lines in the form $y=mx+c$, provides an excellent opportunity to investigate the characteristics of straight line graphs.

Allied to any work with Transform is an option to rescale the axes and so focus on a particular area of interest, for example the point of intersection of graphs of simultaneous equations.

At the higher levels of the GCSE syllabus the transform matrix option does illustrate the effect of 2x2 matrix transformations.

Worksheets can easily be made up by printing screens from the program and then using a word processor to add text.

The graphics are clear and quite comprehensive, but it would improve the clarity of the display if the option to shade the original shape was available. The option to turn off sound was invaluable.

I have used Transform in school with groups of students and with individuals. I also asked other staff to comment freely.

The overall opinion is that this is a good attempt to provide both a group teaching and a private study facility appropriate for use with students in the range from top juniors to the higher levels of GCSE.

It has proved to be a useful teaching aid with the flexibility to allow the motivated individual learners to explore simple coordinate geometry, straight-line graphs and geometrical transformations in an effective and problem-solving manner.

Mike Cannon

Ti-- on --u--

Program: Tish on Shush
Price: £6 (80 track disc)
Authors: Jack and Jill Software
Supplier: R. Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD.

THE title of this Primary level educational adventure had me puzzled for a while; however, !booting the program soon answered my queries.

Tish is a spaceman stranded on the planet Shush, and the children are asked to help him find his lost spaceship so that he can go home: the real purpose of the game is to reinforce spelling practice and the use of the letters sh.

The technique used is quite clever: The children are presented with a situation – say a shoeless shump, (one of the inhabitants of planet Shush). The predicament is written on the screen, but the essential words have spaces for the missing sh.

The children are then invited to fill in the gaps, together with the rest of the word; thus "shoe" in the double height text will appear as --oe, and the child will have ---- beneath it in single height awaiting completion.

Because the program uses speech as well as simple Mode 7 graphics, a wrong entry produces a very creditable "wrong" from the computer. A correct entry results in an equally passable utterance of the letter sound.

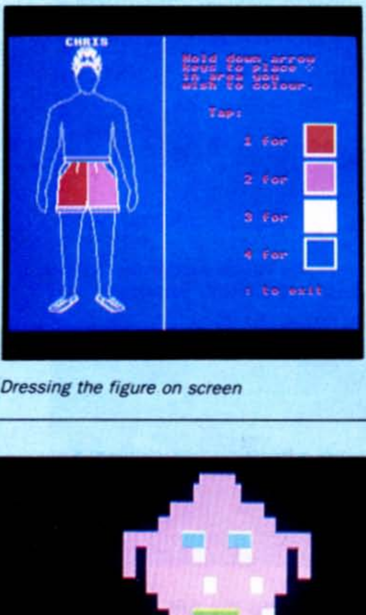
Once again I sent the program off for evaluation to the primary school of which I am a governor, and the comments of the nine-year olds were all favourable.

The user is regularly invited to take appropriate actions involving a Y or N input, and a negative response means the spellings have to be done again – much to the chagrin of the pupil, I

Micro method of fashion design

Product: Fads
Price: £25
Supplier: AUCBE, Endymion Road, Hatfield, Herts Al10 8AU.
Tel: 07072 65443

THE problem with a lot of software is that the initiative comes from the publisher who thinks he knows what people want rather than from the users who know what they want. Of course some people do write programs to do what they want, but these rarely get passed along to others.



```
CHRIS

Hold down arrow
keys to place ▽
in area you
wish to colour.

Tap:

1 for
2 for
3 for
4 for

: to exit
```

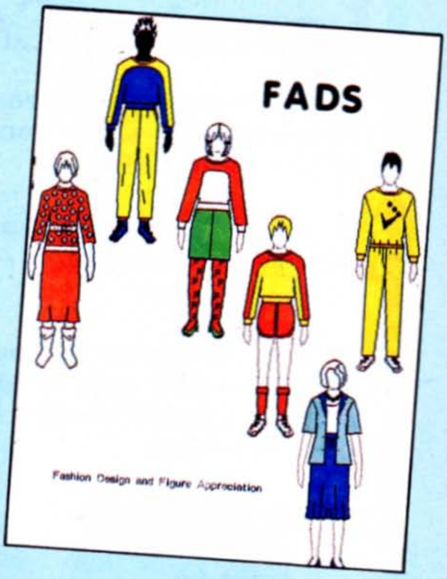
Dressing the figure on screen

Fads, on the other hand, looks like a program written to fill a need which has been taken further and professionally finished and presented. It is, I assume, aimed at schools and colleges with fashion or dressmaking courses, and has been tested during development in various schools.

Fads is a fashion design and figure appreciation package. It enables the pupils to enter their own or their models' measurements and experiment with various outfits – a bit like a computer version of those paper dolls which you could dress in a selection of outfits, clipped on with paper tabs.

The advantage of Fads over the usual drawing and sketching is that you can easily dress and undress the figure, try out jumpers over trousers or tucked into trousers, add accessories, vary hair styles and so forth with only one or two key presses.

You can experiment with a limited number of colours, but if you really want to investigate this aspect you can print off as many copies of an outfit as you want and have fun colouring them in!



The package consists of a simple, clear manual and a program disc and clothes data disc. The program contains a reasonable selection of clothes to experiment with, split up into sections such as skirts, tops, trousers, shorts and so forth.

The female selection had more options than the male, including a selection of neck wear and various sleeve designs.

However, you are not limited to the selection on disc. Fads includes a drawing option for you to design your own clothes and try them on your figure.

If the item is one of a pair (a shoe, for example) you need only draw one and the program will supply the matching item. Similarly, if your design is symmetrical,say a skirt, you need only draw one half.

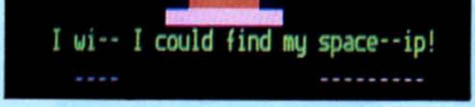
The finished figures can be saved to disc and are automatically named with your figure name and a number, for example 1ANNE, 2ANNE, 1PAUL.

This was the only part of the program which I could really criticise as there was no prompt to insert your files disc before saving, and on at least one occasion I saved my design on to the master disc.

I had problems trying to print out to our non-Epson printer, but it worked fine on an Epson so it might be worth checking that it will work with your printer before buying.

The package is well produced and, at the price, should be a useful aid to fashion students and their teachers.

Elisabeth Dennis



I wi-- I could find my space--ip!

---- ---------

observed. The authors, Jack and Jill Foster, are English (primary) specialists; Jill is responsible for the storyline and graphics, while Jack handles the programming.

The impressive voice effects were produced on BBC Micros without any specialised speech hardware, and seem to use the Speech! program by Superior Software.

The only annoyance was that nearly all the Mode 7 screens, including the compass that appears every time a movement is required, were held on disc, slowing down the program.

As a final comment, I would say that the simple adventure part was enjoyed more than the spelling exercises – but perhaps I should have be expected that.

Recommended. **Bob Redrup.**

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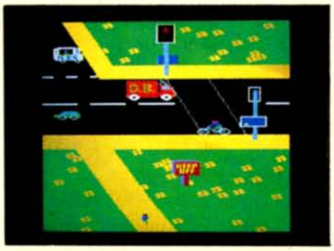
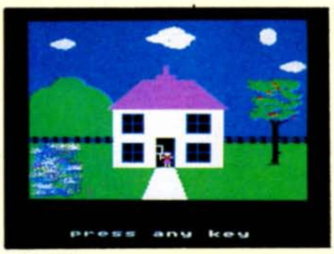
Seaside
Snap



PELICAN
Teach your children to cross the road safely at a Pelican crossing

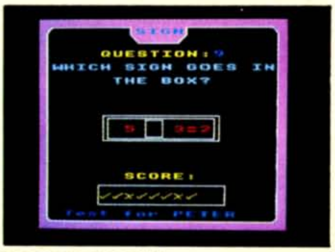


press any key

HOUSE
Select the colours to draw a house – hours of creative entertainment

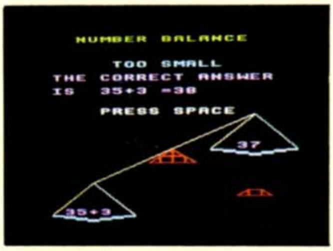
Ages 5-8

Balance
Castle
Derrick
Fred's Words
Hilo
Maths Test
Mouser
Number Signs
Seawall
Super Spell



SIGN
QUESTION: 9
WHICH SIGN GOES IN THE BOX?
SCORE:
✓✓x✓✓✓x✓
Test for PETER

NUMBER SIGNS
Provide the correct arithmetic sign and aim to score ten out of ten

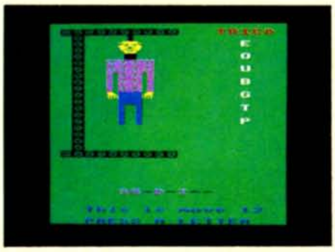


NUMBER BALANCE
TOO SMALL
THE CORRECT ANSWER IS 35+3 =38
PRESS SPACE

BALANCE
Learn maths the fun way. Type in the answer to balance the scales

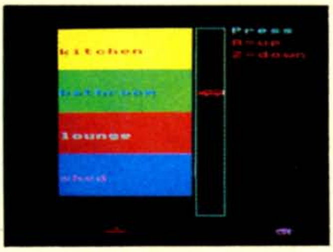
Ages 8-12

Anagram
Codebreaker
Dog Duck Corn
Guessing
Hangman
Maths Hike
Nim
Odd Man Out
Pelmanism
Towers of Hanoi



TRIED
E
O
U
B
G
T
P

HANGMAN
Improve your child's spelling with this fun version of the popular game



kitchen
bathroom
lounge
shed
Press
8=up
2=down

ODD MAN OUT
Find the word that does not fit – before your time runs out

TO ORDER TURN TO THE FORM ON PAGE 167

Swearing by Econet

John de Figueiredo shows Econet is a popular and proven option in many Australian schools

I FOUND the views of Econet outlined by Philip Andrews in the October 1986 issue of *The Micro User* somewhat jaundiced and his experiences completely different to mine. Here at Toorak College, Australia, we find Econet a valuable asset to our educational resources.

I first came across the BBC Micro in late 1981, when Econet was only a promise. Nevertheless my recognition of the potential of Econet was the major factor in my recommending that the school buy BBC Micros, and in my own purchase of one. I have not been disappointed either by the micro itself, or by Econet.

As an aside, I might add that Econet networks took off in Australia much earlier, and more vigorously than in the UK.

Nowhere in his article does Mr Andrews indicate whether he is talking about primary or secondary schools (or both). If he is referring to primary schools then I have to agree with a lot of what he says.

However, in the secondary environment Econet has distinct advantages over stand-alone machines – there are networks operating very successfully in primary schools here, but they are not common.

We have used both level 2 and level 3 file servers, and I have found the Econet system to be very reliable. While there have been a few faults with the parts unique to the network, they have mainly been minor irritations rather than major problems. If I am unable to cure the fault myself our dealer is usually able to fix it, or supply a replacement, very quickly.

While our original 15-station network of model Bs (which cost around $30,000, including installation) was about $9000 cheaper than 15 stand-alone machines, I do not consider price to be an ovewhelming argument in favour of Econet, especially as changes in pricing structure have no doubt altered the balance, as indicated by Mr Andrews. Disc drives sold with BBC systems in this country are still more expensive than they should be, and 40 track drives are very rare indeed.

I agree that teachers must be able to take a computer home whenever they need to; however, it is only necessary to have two or three computers with disc and network interfaces.

Software on hard disc is not an issue. If it is on the hard disc it must have been put there by someone, almost certainly from a floppy disc.

Most Australian schools with BBC Micros have a computer room. Many are now extending their network so that one or two computers can be used in each classroom. This is probably the most versatile arrangement, and means that there is less gear to be carried around, just an Econet cable instead of a disc drive.

Although I didn't realise it when I first met the BBC Micro, one of the greatest advantages of Econet is its ease of use.

With a level 3 fileserver, you just sit in front of any computer, press Shift+Break (or just Break if you make the keyboard link) and you can then use the main public menu to access any of the software on the hard disc, or go into a log-on sequence which allows you to use word processors, databases, spreadsheet, or other languages.

This, of course, presupposes that you have a front-end program, but they are readily available now. This is much easier on the user (and System Manager) than having to make sure users have the correct floppy discs, especially where they are using an application – like a database – which involves swapping program and data discs.

It is a pity there is little, if any, software that makes use of the network's potential for interaction between stations. However, the problem of Econet versions of software has been widely addressed in Australia. Many programs have been released on NFS floppy discs at between one and a half and two times their price on DFS.

In fact the only programs that cause any serious problems with conversion are those that make extensive use of data files via the osbget and osbput routines, and even these only need converting for model Bs and B+s because the ANFS chip in the Master solves the problem. Furthermore, most programs load considerably faster with a level 3 file server than they do on stand-alone machines.

The problem of copyright on a network is a thorny one. The release of programs in Econet versions goes some way to solving it, and some manufacturers of rom-based software are offering special deals on multiple copies of their roms for network use (with, say, two or three copies of the manual).

While Mr Andrews deprecates the idea of a network system manager, he does acknowledge the need for someone in the school to coordinate the efforts of each teacher. Who else is going to make copies of all the discs required?

I must confess that I agree with the teacher quoted in the article: "It's great, I have got away from having to make copies of all those separate discs". When you see the way many teachers (and some students) treat discs you wonder how they ever get anything to work.

In our school we have some IBM clones as well as the BBC Micros. They are also networked, but each machine has its own single disc drive. Several teachers wanted to use them over the holidays, using an integrated software package that comes on eight 360k floppies. I found copying these, a system disc, and a couple of data discs a real chore.

The idea of having to make, and keep track of, multiple copies of all software in the school is daunting. In Australia, if not in the UK, many schools swear by their networks. I think they're great, especially if you have a computer room and network points throughout the school. ■

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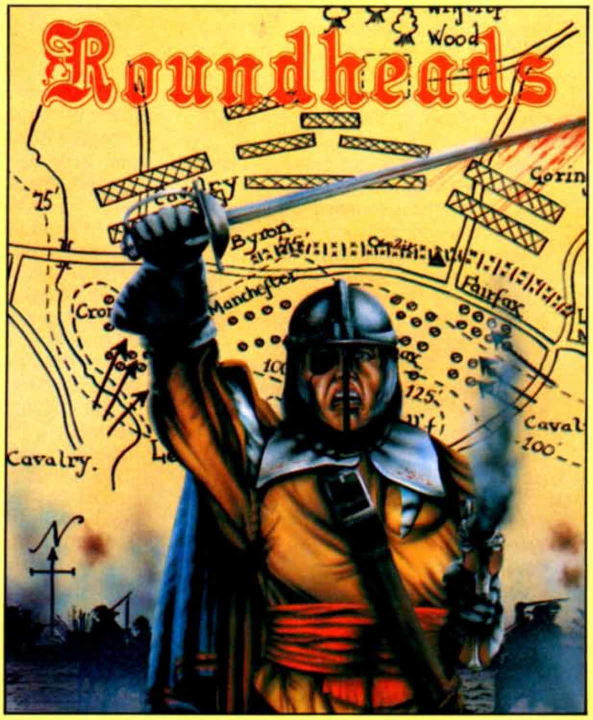

WORLD WAR ONE

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The cereal interface

Norman Parr and Gareth Proud bring farming into the classroom

CANSIM and its linked program, Farm, were designed primarily for older secondary pupils, but could be modified by leaving out a number of procedures if simplification was thought to be necessary.

Basically they simulate the general organisation of a wheat farm on the Canadian prairies in Saskatchewan. Two files make up the package. The first, Cansim, contains the location – a map of the main wheat farming area – and instructions governing the general organisation.

After working through this introduction the second file, Farm, will be CHAINed in – so it's vital to ensure this second file is SAVEd under the name FARM. The files will run on both disc and cassette systems. It is possible to use Farm on its own and produce written information as an introduction.

The aim is for the student to try to run the farm for 10 years making various decisions affecting income. The starting point is to choose a crop for each of the eight fields from a choice of four. It is necessary to rotate the crops and use fallow in each field at least once every four years.

In terms of this simulation fallow really stands for land management policies other than rotation. Poor farming practices will lead to falling yields (exaggerated to make more impact) and lower incomes.

It is a good idea to ask the students to practise wheat monoculture for the first run through. They will be very lucky to survive ten years and much fruitful discussion should follow.

After this decisions must be made on fertiliser inputs, and the table in Cansim is very useful here. This will serve to illustrate the need to be cost effective in terms of farming inputs, as will the decision on whether to irrigate peas.

The major area of decision-making involves marketing the wheat. Wheat prices fluctuate, and in this program are simplified to be linked to rainfall and yields.

Each year the farmer may choose to sell some wheat – but might the prices be higher next year? Obviously discussions start from this situation as to how farmers and governments cope with the problem.

The income in any year is affected by the yield-hectare. This is controlled by a combination of factors – rotation, fertilisers, irrigation and rainfall. The rainfall factor is not controlled by the farmer and the general ranges chosen fit the area.

Within the program the rainfall for each year is chosen at random but weighted towards the general range 250-399mm per year (see PROCchance, lines 1860-1910).

A further study of this procedure will show that chance factors such as a wet harvest or major mechanical breakdown play a part in the farmer's year.

At the end of each year a summary graph is provided showing the relationship between capital and income. This graph (PROCsummary) will run for 10 years providing the farmer remains solvent. If the farmer has capital reserves showing that he owes more than $20,000 for two consecutive years then the bank calls in the Receiver.

If capital in any year falls below $0 then the farmer has to borrow from the bank. Of course he must pay interest, and this makes life even more difficult.

At each stage in the year information must be carefully booked down and farm plans, outline graphs and account sheets should be supplied.

Note that the program does not wait at the end of the crop input procedure (PROCinput) because the farm plan for that year should be done before planting the crops. It is difficult to remember the pattern without booking it down, and failure to do so could bring a penalty later in the program.

The program is structured to allow for changes to be made in the variables. You could alter some of the factors in order to emphasise a particular problem. For example, world prices could be changed in lines 2050-2070, crop yields are in lines 1870-1910 under *WY*, *RY* and *PY* (*W* for wheat and so on).

If anyone makes use of this program in the classroom we will be only too happy to hear from them and learn from their experiences.

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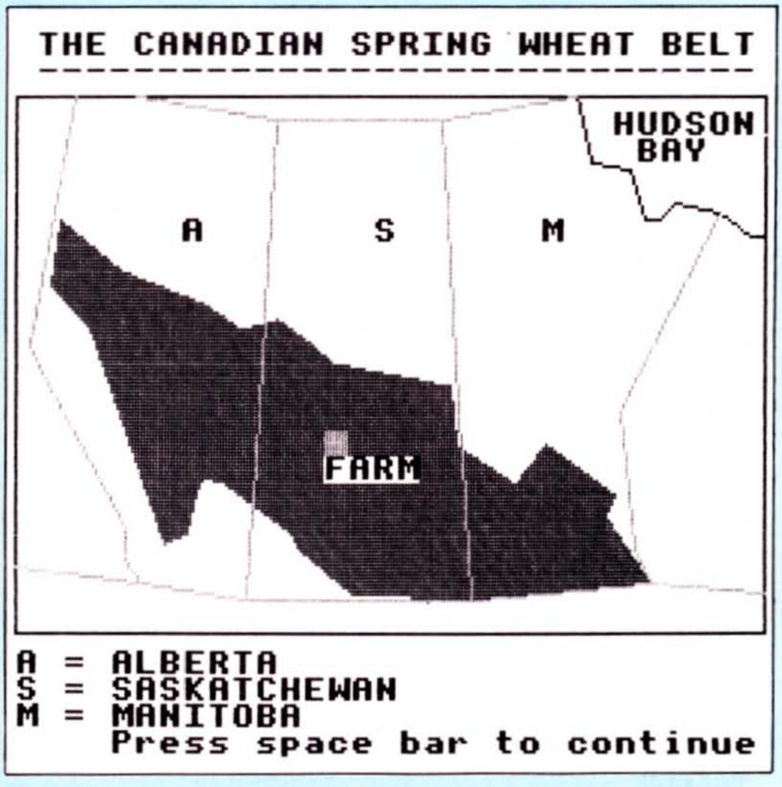

```
THE CANADIAN SPRING WHEAT BELT
--------------------------------
```

```
A = ALBERTA
S = SASKATCHEWAN
M = MANITOBA
    Press space bar to continue
```

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FARM PROCEDURES

farm	Draws the farm.
input	Controls the field planting after drawing a text window.
expend	Keeps track of capital reserves.
wheat, rs and peas	Sorts out the number of fields for each crop and adjusts the fertiliser effects via PROCfert1.
personal and purse	Works out the income and capital levels.
chance	Works out the chance factors, rainfall and yields.
rain	Checks fallow *(fallow)* and rotation *(croprep)* and then calculates the production for the year for each crop.
mkt	Produces the final income from sales and summarises the general income.
summary	Draws the income and capital graph.

FARM VARIABLES

F$(10,8)	2-D array holding the crop pattern for the eight fields over 10 years.
INC(10) and c(10)	Income and capital for the 10 years.
FeW,FeR and FeP	Fertiliser inputs for each crop.
FW,FR,FP and FF	Number of fields with a particular crop.
Wyi, Pyi and Ryi	Total production figures for each crop.
st	Tonnage of wheat held in store.
Bor	Capital that must be borrowed to remain solvent.

CANSIM PROCEDURES

init	Sets up the keys, colours and characters.
prairie	Draws the introduction screen and moves the combined harvester.
map	Produces a map of the spring wheat belt and locates the farm.
text	Pages through the simulation instructions.

Listing I

```
   5REM(c) The Micro User
  10IFPAGE>&1100THEN1650
  20MODE1:VDU23;11,0;0;0;0
  30PROCinit
  40PROCprairie
  50PROCmap
  60MODE7
  70PROCtext
  80A$=GET$
  90IFA$<>" "THEN 80
 100CHAIN"FARM"
 110END
 120DEFPROCinit
 130*KEY10 OLDM RUNM
 140*FX220,0
 150DIMC$(7):DIMD$(29):X=1:Y=1:DIMQ%(51
):DIMR%(51)
 160VDU23,225,0,0,0,0,0,0,254,255:VDU23
,224,0,0,192,224,224,240,255,255
 170VDU23,226,0,0,0,0,0,31,63,255:VDU23
,227,15,15,31,63,127,255,255,255:VDU23,2
28,255,255,255,255,255,255,255,255:B$=CH
R$226+CHR$227+CHR$228
 180VDU23,230,0,0,0,0,66,36,28,255
 190VDU23,231,0,0,0,0,8,8,8,255
 200FORJ%=2TO7:READ C$(J%):NEXT
 210DATA C,A,N,S,I,M
 220FORJ%=2TO29:READD$(J%):NEXT
 230DATA d,u,o,r,P, ,h,t,e,r,a,G, ,d,n,
a, ,r,r,a,P, ,n,a,m,r,o,N
 240VDU23;10,32;0;0;0;
 250VDU19,0,4,0,0,0
 260ENDPROC
 270DEFPROCprairie
 280VDU28,0,9,39,0
 290COLOUR128
 300VDU28,0,31,39,10
 310COLOUR130
 320CLS
 330VDU26
 340GCOL0,1
 350VDU29,640;0;
 360MOVE-640,700:DRAW640,700
 370FORX%=-640TO640STEP20
 380MOVEX%,700:DRAW4*X%,0
 390NEXT
 400A$=CHR$224+CHR$225
 410COLOUR128
 420FORI%=0TO39
 430PRINTTAB(I%,5)A$
 440IFI%<25ANDI%>13PROCdrop
 450A=INKEY(10)
 460COLOUR128
 470PRINTTAB(I%,5)"  "
 480NEXT
 490FORI%=1TO17:PRINTTAB(I%,9)"b":A=INK
EY(5):PRINTTAB(I%,9)" ":NEXT
 500PRINTTAB(I%,9)"b"
 510FORI%=39TO20STEP-1:PRINTTAB(I%,9)"y
":A=INKEY(5):PRINTTAB(I%,9)" ":NEXT
 520PRINTTAB(I%,9)"y"
 530COLOUR1:COLOUR130
 540FORK%=37TO1STEP-1
 550IFK%MOD2=0PRINTTAB(K%-1,16)CHR$230
ELSE PRINTTAB(K%-1,16)CHR$231
 560PRINTTAB(K%,16)B$
 570IFK%<31ANDK%>2PROCdrop2
 580A=INKEY(20)
 590PRINTTAB(K%-1,16)"    "
 600NEXT
 610PRINTTAB(6,20)"EXTENSIVE COMMERCIAL
 FARMING"
 620PRINTTAB(8,22)"ON THE CANADIAN PRAI
RIES"
 630PROCspace
 640VDU26:VDU20
 650ENDPROC
 660DEFPROCmap
 670COLOUR128:CLS
 680FORI=1TO51
 690READQ%(I):Q%(I)=Q%(I)*10
 700READR%(I):R%(I)=R%(I)*10
 710NEXT
 720DATA 10,85,110,85,110,20,10,20
 730DATA 87,77,92,76,94,70,96,70,98,72,
104,71,108,68,110,68
 740DATA 89,34,90,37,81,43,77,38,69,43,
68,50,52,53,48,56,45,58,40,57,35,60,24,6
4,38,38,47,32,48,30,55,25
 750DATA 16,70,15,62,20,57,30,31,33,32,
34,37,35,39,38,38,24,64
 760DATA 12,55,13,53,25,33,25,29,27,26,
41,24,45,82,67,82,67,82,71,24,95,26,93,3
0,91,47,104,71
 770PRINTTAB(4,3)"THE CANADIAN SPRING W
HEAT BELT"
 780PRINT"   -------------------------
-----"
 790MOVE100,200:FORI=1TO4
 800DRAWQ%(I),R%(I):NEXTI
 810MOVE850,850:FORI=5TO12
 820DRAWQ%(I),R%(I):NEXTI
 830PRINTTAB(28,6)"HUDSON":PRINTTAB(29,
7)"BAY"
 840GCOL0,2
 850MOVE710,240:MOVE950,260
 860FORI=13TO28
 870PLOT85,Q%(I),R%(I)
 880MOVE710,240:NEXTI
 890MOVE220,600:MOVE240,640
 900FORI=29TO37
 910PLOT85,Q%(I),R%(I)
 920MOVE220,600:NEXTI
 930GCOL0,1
 940MOVE180,850:FORI=38TO51
 950DRAW Q%(I),R%(I)
 960NEXTI
 970MOVE450,820:DRAW260,850:MOVE270,260
:DRAW100,280:MOVE410,240:DRAW710,240:MOV
E670,820:DRAW850,850:MOVE950,260:DRAW110
```

```
0,250
  980PRINTTAB(10,10)"A":PRINTTAB(2,27)"A
 = ALBERTA"
  990PRINTTAB(18,10)"S":PRINTTAB(2,28)"S
 = SASKATCHEWAN"
 1000PRINTTAB(25,10)"M":PRINTTAB(2,29)"M
 = MANITOBA"
 1010COLOUR1
 1020PRINTTAB(16,18)CHR$228
 1030COLOUR3
 1040PRINTTAB(16,19)"FARM"
 1050PROCspace
 1070ENDPROC
 1080PROCtitle
 1090VDU23;11,0;0;0;0
 1100PRINTTAB(5,4)CHR$141CHR$131"A WHEAT
 FARMING SIMULATION"
 1110PRINTTAB(5,5)CHR$141CHR$129"A WHEAT
 FARMING SIMULATION"
 1120PRINTTAB(12,12)CHR$141CHR$131"INSTR
UCTIONS"
 1130PRINTTAB(12,13)CHR$141CHR$129"INSTR
UCTIONS"
 1140PROCspace1
 1150CLS
 1160ENDPROC
 1170DEFPROCtext
 1180PRINT'"   This farm is situated in
 the heart ofCanada's Spring Wheat Belt
 in   the    province of Saskatchewan. T
he  farm  is made up of eight quarter-se
ctions  each being the standard 65 hecta
res."
 1190PRINT'"  The farmer's aim is to ac
hieve  the  maximum profit from the land
 available  by growing three crops :-"
 1200PRINTCHR$131"               WHEAT":PRI
NTCHR$131"             RAPESEED":PRINTCHR
$131"          PEAS"
 1210PRINT"  He can grow any one or com
bination ofthese crops. He can also inpu
t varying  amounts of fertilisers upto a
 limit of  5 units per field. The farmer
 must know the amount of fertiliser to a
pply to"
 1220PRINT"avoid using  too little, whic
h would    lower yields. Irrigation can
also be    used but only for peas."'
 1230PROCspace1
 1240CLS
 1250PRINT''"Here is a list of fertilis
er inputs and yield improvements"
 1260PRINT"           Increase in yields
per hectare"
 1270PRINT"Crop          1    2    3    4
    5"
 1280PRINT'"Wheat        0.05  0.2  0.3
0.3  0.3"
 1290PRINT'"Rapeseed     0.05  0.2  0.3
0.4  0.4"
 1300PRINT'"Peas         0.12  0.12 0.12
0.12 0.12"
 1310PRINT''"Units are in tonnes per hec
tare"
 1320PROCspace1
 1330CLS
 1340PRINT''"The crop yield  is  affect
ed  by the   rainfall. The rainfall is
low in this   area some years having les
s than 200mm  and others having more tha
n 600mm.      Normally rainfall is betwe
en 300 and 400mm."
 1350PRINT'"The profit is controlled by
the yield    and the situation in the wor
ld market."
 1360PRINT'"The Prairie soil  will  not
 allow       continuous cropping without
a fall in    yield and serious damage to
the soil.    It is necessary for the farm
er to use a crop rotation."
 1370PRINT'"Yields will fall if  the  sa
me  crop  isgrown in a field two years r
unning and  if it is not left fallow at
least one    year in four."'
 1380PROCspace1:CLS
 1390PRINT''"    You have to run this fa
rm  for  ten  years. The measure of your
 success is   the amount of money you ha
ve made at theend of each year."
 1400PRINT'"    You have $150,000  to st
art and you   can choose each year :-"
 1410PRINT"  1. The combination of crops
 and their rotation."
 1420PRINT"  2. The  amount  of  money
spent  on  fertiliser and irrigation."
 1430PRINT'"    It is important to keep
a record of  your choices and results  a
s  you  go   along."
 1440PRINT''CHR$129"PRESS SPACE BAR WHEN
 READY"
 1450ENDPROC
 1460DEFPROCdrop
 1470IFI%MOD2<>0 ENDPROC
 1480X=X+1
 1490PRINTTAB(I%,6)C$(X)
 1500ENDPROC
 1510DEFPROCdrop2
 1520Y=Y+1
 1530PRINTTAB(K%+3,16)D$(Y)
 1540ENDPROC
 1550DEFPROCspace
 1560PRINTTAB(6,30)"Press space bar to c
ontinue"
 1570Z$=GET$
 1580IFZ$<>" "THEN1570
 1590ENDPROC
 1600DEFPROCspace1
 1610PRINTTAB(6,23)CHR$136CHR$130"Press
space bar to continue"
 1620Z$=GET$
 1630IFZ$<>" "THEN1620
 1640ENDPROC
 1650FORI%=0TOTOP-PAGE STEP4:I%!&1100=I%
!PAGE:NEXT
 1660?&13=?&13-(PAGE-&1100)DIV256:PAGE=&
1100
 1670RUN
```

Listing II

```
    5REM(c) The Micro User
   10IFPAGE<>&E00THEN2690
   20MODE1
   30VDU23;11,0;0;0;0
   40*KEY10 OLDM RUNM
   50*FX220,0
   60DIMX(8),Y(8),F$(10,8),c(10),Z(10),I
NC(10)
   70c(0)=150000:S%=0:st=0:Z=185
   80FORI=1TO8
   90READX(I),Y(I)
  100NEXT
  110DATA 30,750,230,750,430,750,430,550
 430,350,230,350,230,150,695,350
  120FORYr=1TO10
  130VDU20
  140FeW=0:FeR=0:FeP=0
  150FW=0:FR=0:FP=0:Ft=0:FF=0:F=0
  160PROCfarm
  170PROCinput
  180PROCexpend
  190PROCwheat
  200CLS
  210PROCrs
  220CLS
  230PROCpeas
  240CLS
  250PROCirg
  260PROCpersonal
  270PROCsp
  280PROCpurse
  290PROCsp
  300PROCchance
  310PROCsp:CLS
  320PROCrain
  330PROCsp
  340VDU20,26
  350PROCmkt
  360PROCsummary
  370NEXTYr
  380VDU11:PRINT"    WELL DONE - YOU MAD
E IT!"
  390END
  400DEFPROCfarm
  410COLOUR129:CLS
  420PRINTTAB(20,8)"R":PRINTTAB(20,12)"O
":PRINTTAB(20,16)"A":PRINTTAB(20,20)"D"
  430PRINTTAB(15,2)"Farm Plan   Year ";Y
r:PRINTTAB(23,15)"FARM"
  440PRINTTAB(4,6)"1":PRINTTAB(10,6)"2":
PRINTTAB(16,6)"3":PRINTTAB(16,13)"4":PRI
NTTAB(16,19)"5":PRINTTAB(10,19)"6":PRINT
TAB(10,25)"7":PRINTTAB(24,19)"8"
  450MOVE25,700:DRAW25,900:DRAW625,900:D
RAW625,700:DRAW25,700
  460MOVE225,900:DRAW225,700:MOVE425,900
:DRAW425,100:DRAW225,100
  470DRAW225,500:DRAW625,500:DRAW625,300
:DRAW225,300:MOVE625,300:DRAW625,100:MOV
E625,700:DRAW626,500:MOVE690,900:DRAW690
,100
  480MOVE690,500:DRAW890,500:DRAW890,300
:DRAW690,300
  490MOVE730,500:DRAW730,540:DRAW690,540
:GCOL0,2:PLOT85,730,500:PLOT85,690,500
  500ENDPROC
  510DEFPROCinput
  520VDU28,22,13,39,3:COLOUR130:CLS:COLO
UR0
  530FORI=1TO8
  540PRINT"Type in the first letter of t
he cropfor field ";I:INPUTF$(Yr,I)
  550IFF$(Yr,I)<>"W"ANDF$(Yr,I)<>"P"ANDF
$(Yr,I)<>"R"ANDF$(Yr,I)<>"F"THENPRINT"RE
PEAT":GOTO540
  560IFF$(Yr,I)=""GOTO540
  570VDU5:GCOL0,0
  580IFF$(Yr,I)="W"MOVEX(I),Y(I):PRINT"W
heat":FW=FW+1
  590IFF$(Yr,I)="P"MOVEX(I),Y(I):PRINT"P
eas":FP=FP+1
```

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```
  600IFF$(Yr,I)="R"MOVEX(I),Y(I):PRINT"R
"seed":FR=FR+1
  610IFF$(Yr,I)="F"MOVEX(I),Y(I):PRINT"F
allow":FF=FF+1
  620VDU4:CLS:NEXT
  630VDU26,20
  640ENDPROC
  650DEFPROCexpend
  660VDU26:CLS
  670PRINTTAB(10,2)"EXPENDITURE"
  680IFc(Yr-1)<1C=0ELSEC=c(Yr-1)
  690IFC=0PRINT'"You owe $";SQR((c(Yr-1
))^2):PRINT"You must borrow to buy
:-":
GOTO720
  700PRINT'"You have $";C" to spend"
  710PRINT"Decide how much to spend on
:-"
  720PRINT"1. FERTILISER":PRINT"2. IRR
IGATION":PRINT"3. INCOME AND COSTS":PRI
NT"4. RESERVE"
  730VDU28,5,28,35,18
  740COLOUR129:CLS
  750ENDPROC
  760DEFPROCfert
  770PRINT"1. FERTILISER"
  780PRINT"How many units for each field
?"
  790PRINT"Maximum is 5 units"
  800ENDPROC
  810DEFPROCfert1
  820Ft=0
  830PRINT"Type in the number of units"
  840INPUTFt:IFFt<0ANDFt>5THEN840
  850IFFt>5PRINT"TOO MUCH - REPEAT":GOTO
840
  860ENDPROC
  870DEFPROCwheat
  880IFFW=0ENDPROC
  890PROCfert
  900PRINT"You have ";FW" fields of whe
at"
  910PROCfert1
  920F=F+(Ft*FW)
  930IFFt=1FeW=.05
  940IFFt>3Ft=3
  950IFFt>1FeW=Ft*.1
  960ENDPROC
  970DEFPROCrs
  980IFFR=0ENDPROC
  990PROCfert
 1000CLS:PROCfert:PRINT"You have ";FR"
fields of rapeseed"
 1010PROCfert1
 1020F=F+(Ft*FR)
 1030IFFt=1FeR=.05
 1040IFFt>4Ft=4
 1050IFFt>1FeR=Ft*.1
 1060ENDPROC
 1070DEFPROCpeas
 1080IFFP=0ENDPROC
 1090PROCfert
 1100CLS:PROCfert:PRINT"You have ";FP"
fields of peas"
 1110PROCfert1
 1120F=F+(Ft*FP)
 1130IFFt>0FeP=.12
 1140ENDPROC
 1150DEFPROCirg
 1160IFFP=0ir=0:ENDPROC
 1170CLS:PRINT"2. IRRIGATION"
 1180PRINT"You have ";FP" fields of pea
s"
 1190PRINT"Do you want to irgate these?"
 1200PRINT"It will cost you $";FP*1000
 1210PRINT':PRINT"Answer Y or N":INPUTAn
s$
 1220IFAns$<>"N"ANDAns$<>"Y"THEN1210
 1230IFAns$="Y"ir=.24ELSEir=0
 1240ENDPROC
 1250DEFPROCpersonal
 1260CLS:PRINT"3. INCOME AND COSTS"
 1270PRINT"You need at least $80,000 to
   live on"
 1280PRINT"This has been taken off your
  capital":PRINT'
 1290ENDPROC
 1300DEFPROCpurse
 1310CLS:PRINT"4. RESERVE"
 1320PRINT"You have spent :-"
 1330IFFFF=8F=0
 1340IFir>0M$=STR$(FP*1000)ELSEM$="0"
 1350PRINT"1. FERTILISERS $";F*1000
 1360PRINT"2. IRRIGATION  $";M$
 1370PRINT"3. INCOME AND COSTS $80,000"
 1380PRINT"The money you have left goes
into reserve"
```

This is one of hundreds of programs now available FREE for downloading on MicroLink

```
 1390exp=80000+(F*1000)+VAL(M$)
 1400bor=0
 1410IFYr=1c(Yr)=c(0)-exp ELSEc(Yr)=c(Yr
-1)-exp
 1420IFexp>c(Yr-1)PROCbor
 1430PRINT"Capital now is $";c(Yr)
 1440ENDPROC
 1450DEFPROCbor
 1460PROCsp
 1470bor=exp-c(Yr-1)
 1480VDU26:COLOUR131:CLS
 1490COLOUR1:PRINTTAB(5,1)"B A N K  L O
A N"
 1500COLOUR0
 1510PRINT"You have had to borrow $";bo
r:PRINT"This must be REPAID at SALE TIM
E"
 1520PRINT"It will also cost you 20% in
terest":PRINT"This is $";INT(bor/5)'
 1530bor=INT(bor+bor/5)
 1540c(Yr)=0
 1550ENDPROC
 1560DEFPROCrain
 1570fallow=0:crep=0
 1580PROCfallow
 1590PROCcroprep
 1600IFWY<0WY=0
 1610IFRY<0RY=0
 1620Wyi=65*FW*WY:Ryi=65*FR*RY:Pyi=65*FP
*PY
 1630COLOUR2
 1640PRINTTAB(8,2)"RAINFALL and YIELDS"
 1650PRINT"Rainfall this year is "ra$
 1660PRINT'"This gives yields of :-"
 1670PRINTTAB(8,12)"WHEAT    ";INT(Wyi)"
 tonnes":PRINTTAB(8,14)"RAPESEED ";INT(R
yi)" tonnes":PRINTTAB(8,16)"PEAS     ";I
NT(Pyi)" tonnes"
 1680IFfallow=1PRINT"YOU HAVE A LOWER Y
IELD":PRINT"- CHECK FALLOW ROTATION"
 1690IFcrep=1ANDFF<8PRINT"YOU HAVE PLAN
TED THE SAME CROP IN AT":PRINT"LEAST ON
E FIELD FOR THE LAST TWO YEARS":PRINT"-
 YIELDS FALL"
 1700ENDPROC
 1710DEFPROCfallow
 1720IFYr<4ENDPROC
 1730FORJ=0TO3
 1740FORK=1TO8
 1750IFF$(Yr-J,K)="F"ENDPROC
 1760NEXT:NEXT
 1770fallow=1
 1780IFfallow=1WY=WY-0.81:RY=RY-0.81:PY=
PY-0.4
 1790ENDPROC
 1800DEFPROCcroprep
 1810FORJ=1TO8
 1820IFF$(Yr-1,J)=F$(Yr,J)crep=1
 1830NEXTJ
 1840IFcrep=1WY=WY-0.81:RY=RY-0.81:PY=PY
-0.4
 1850ENDPROC
 1860DEFPROCchance
 1870rain=RND(99)
 1880IFrain<10ra$="less than 200mm":WY=1
.08+FeW:RY=1.08+FeR:PY=0.67+FeP+ir:P$="H
IGH"
 1890IFrain>9ANDrain<30ra$="200 - 249mm"
:WY=1.35+FeW:RY=1.21+FeR:PY=0.81+FeP+ir:
P$="HIGH"
 1900IFrain>29ANDrain<60ra$="250 - 299mm
":WY=1.62+FeW:RY=1.35+FeR:PY=1.08+FeP+ir
:P$="FAIR"
 1910IFrain>59ANDrain<85ra$="300 - 399mm
":WY=1.89+FeW:RY=1.08+FeR:PY=1.35+FeP+ir
:P$="FAIR"
 1920IFrain>84ra$="more than 400mm":WY=2
.16+FeW:RY=1.08+FeR:PY=1.35+FeP+ir:P$="L
OW"
 1930ch=RND(70)
 1940VDU26,19,1,4;0;:COLOUR129:CLS:COLOU
R3
 1950PRINTTAB(10,1)"CHANCE FACTORS":IFch
<5C$="LATE FROST":WY=WY-.27:RY=RY-.27:PY
=PY-.13
 1960IFch>4ANDch<11C$="HAIL":WY=WY-.54:R
Y=RY-.54:PY=PY-.27
 1970IFch>10ANDch<21C$="WET HARVEST":WY=
WY-.13:RY=RY-.13:PY=PY-.13
 1980IFch>20ANDch<31C$="MAJOR MECHANICAL
 BREAKDOWN - COST   $50,000":c(Yr)=c(Yr)
-50000::WY=WY-.27:RY=RY-.27:PY=PY-.13
 1990IFch>30ANDch<36C$="WIND DAMAGE":WY=
WY-.13:RY=RY-.13:PY=PY-.13
 2000IFch>35C$="NO PROBLEMS - RELAX!"ELS
EPRINTTAB(3,7)"This means that yields ar
e reduced"
 2010PRINTTAB(4,4)C$
 2020ENDPROC
 2030DEFPROCmkt
 2040COLOUR130:CLS:COLOUR0
 2050PRINT"WORLD WHEAT PRICES FOR YEAR
";Yr
 2060IFP$="HIGH"PRICE=200
 2070IFP$="FAIR"PRICE=150
 2080IFP$="LOW"PRICE=100
 2090PRINT"Wheat prices this year are "
;P$
 2100PRINT"Your wheat will sell for $";
PRICE" per tonne"
 2110PRINT"How much wheat are you going
 to sell?"
 2120PRINT"You have ";INT(Wyi)" tonnes
from this year"
 2130PRINT"YOU ALSO HAVE ";S%" IN STORE
"
```

Turn to Page 80 ▶

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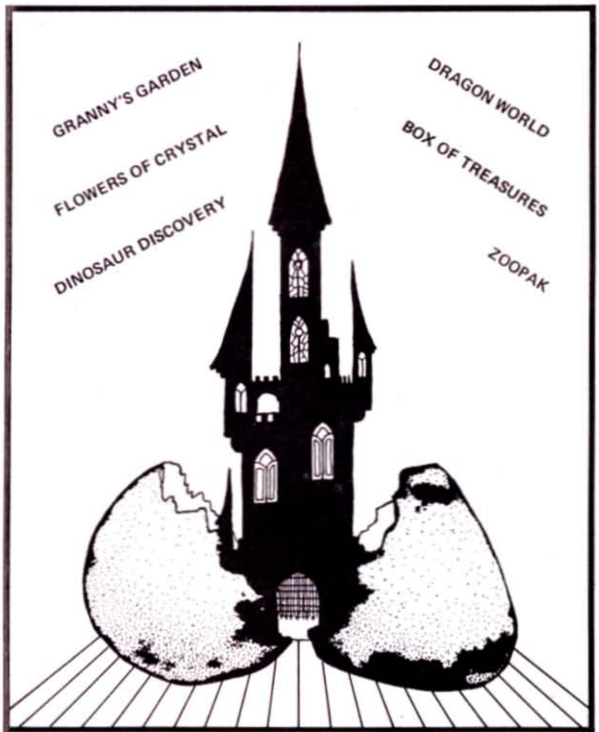
◀ From Page 78

```
 2140IFS%=0ANDINT(Wyi)=0GOTO2200
 2150PRINT'"Type in the AMOUNT, then pre
ss RETURN"
 2160INPUTWhsell
 2170IFWhsell>S%+INT(Wyi)PRINT"THIS IS M
ORE THAN YOU HAVE - TRY AGAIN":GOTO2160
 2180st=INT(Wyi)-Whsell
 2190S%=S%+st
 2200IFS%<0S%=0
 2210PRINT'"Wheat left in STORE is ";S%
 2220PRINT'"This gives you an INCOME of
$";(INT(Wyi)-st)*PRICE
 2230PRINT'"Income from peas =$";INT(Pyi
)*150
 2240PRINT'"Income from rapeseed =$";INT
(Ryi)*150
 2250PROCsp
 2260ENDPROC
 2270DEFPROCsummary
 2280VDU19,2,4,0,0,0
 2290INC(Yr)=(INT(Wyi)-st)*PRICE+INT(Ryi
)*150+INT(Pyi)*120
 2300c(Yr)=c(Yr)+(INT(Wyi)-st)*PRICE+INT
(Ryi)*150+INT(Pyi)*120-bor
 2310COLOUR131:CLS
 2320COLOUR2:PRINTTAB(2,1)"SUMMARY SHOWI
NG ";:COLOUR0:PRINT"INCOME ";:COLOUR2:PR
INT"AND";:COLOUR1:PRINT" CAPITAL"
 2330GCOL0,2:MOVE80,950:DRAW1150,950:MOV
E200,150:DRAW1100,150:MOVE200,150:DRAW20
0,900
 2340COLOUR2:PRINTTAB(1,28)"YEAR"
 2350VDU5:no=-200:GCOL0,2:FORK=160TO910S
TEP75:MOVE50,K:no$=STR$(no):PRINTno$:no=
no+40:NEXT
 2360FORI=235TO910STEP75:MOVE170,I:PRINT
"-":NEXT
 2370MOVE185,150:FORI=185TO1140STEP100:M
OVEI,150:PRINT"":NEXT
 2380yr=1:MOVE185,100:FORI=185TO1140STEP
100:MOVEI,100:yr$=STR$(yr):PRINTyr$:yr=y
r+1:NEXT
 2390Z(Yr)=Z
 2400Z=Z+100
 2410VDU5
 2420MOVE200,520:DRAW1140,520
 2430FORI=1TOYr
 2440c1=c(I-1):INC1=INC(I-1)
 2450c=c(I):INC=INC(I)
 2460IFc>200000c=200000
 2470IFINC>200000INC=200000
 2480IFc1>200000c1=200000
 2490IFINC1>200000INC1=200000
 2500GCOL0,1
 2510MOVEZ(I),535+c/533:PRINT"*"
 2520GCOL0,0:MOVEZ(I),535+INC/533:PRINT"
+"
 2530IFI=1GOTO2560
 2540GCOL0,1:MOVEZ(I-1)+15,520+c1/533:DR
AWZ(I)+15,520+c/533
 2550GCOL0,0:MOVEZ(I-1)+15,520+INC1/533:
DRAWZ(I)+15,520+INC/533
 2560NEXT
 2570VDU4
 2580IFc(Yr)<-20000ANDc(Yr-1)<-20000PROC
end
 2590PROCsp
 2600ENDPROC
 2610DEFPROCend
 2620VDU28,10,13,31,5:COLOUR129:CLS
 2630COLOUR3:PRINT'"BANK CALLS IN RECEI
VER":PRINT"  YOU ARE BANKRUPT":END
 2640ENDPROC
 2650DEFPROCsp
 2660PRINTTAB(1,30)"Press space bar to c
ontinue"
 2670A$=GET$:IFA$<>" "THEN2670
 2680ENDPROC
 2690*TAPE
 2700FORI%=0TOTOP-PAGE STEP4:I%!&E00=I%!
PAGE:NEXT
 2710?&13=?&13-(PAGE-&E00)DIV256:PAGE=&E
00
 2720RUN
```

This listing is included in this month's tape & disc offer. See order form on Page 167.



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Peter Davidson, Education Editor, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

Not for the few . . .

I READ with some sorrow the letter from Ms Doreen Goldstone of Danbury in the Education section of the April issue of The Micro User.

I am a self-taught user of word processors and a primary provider of INSET to both college and school teachers. As such I had hoped that the distinction between training a person to be a word processor operator for a specific vocation, and the provision of tuition to enable a person to benefit from the power of a word processor in other areas, was more widely understood.

While I accept that the student, or teacher, being taught about word processors with an aim to use them at a professional level should be taught by a professional, to try and apply this to all those who wish to exploit the potential of this technology is wholly inappropriate.

Are you really proposing that a student on an English, Humanities, Computer Studies or Special Needs course should also have to study word processing to the level required by the R.S.A. If this is what you mean then you will be effectively denying these people access to this technology.

The whole point of the word processor to these people is that it allows them the freedom to produce "adequate" typed output without the need to first learn full keyboarding skills. It is never intended to produce users of a standard sufficient for demands of the professional users of the technology.

The word processor is a tool, and like any other tool some users train to the full in its use, while others learn enough to benefit and cover their own personal needs.

Heaven forbid that we should ever fall into the trap of insisting that a person wishing to exploit the basics of a technology should be trained to a professional level before we deem them fit to use the technology at all.

The whole thrust of the development of computers and the software they offer is to make them available to as many as possible, not just the limited few. – **Mike McNamara, Barnet, Herts.**

Out goes Econet

WHAT is the easiest way to stop my BBC Micro recognising that the Econet interface is fitted but keep the DFS?

Can this be done by software, altering links, or do I need to move components? – **J. Rogers, Stratton Saint Margaret, Swindon, Wilts.**

● Econet can be disconnected by typing ?&224=&A6 followed by *DISC and PAGE=&1900.

Single colour

I NOTICE with interest the One Colour Mode 7 program listed in March issue of The Micro User. *It is a very interesting program and uses an elegant method but, being mostly in Basic and taking a sizeable amount of memory, it is of limited use in educational computing.*

This is particularly true if, as most educational programs are, the program to be converted to one colour is very long.

*I have therefore reworked the program completely so that the computer can be converted to one colour mode 7 simply by inserting the line: *COLOUR <1..7> into a program.*

*The Basic program listed here assembles the machine code and saves it to disc so that the *COLOUR command recalls and executes it.*

The parameter should be in the range 1 to 7 and indicates the colour which is to be used, 1 is red, 2 is green and so on. The one colour mode can then be switched on or off by using CALL &910.

No Basic procedures have to be typed or spooled onto the end of the program, so this version of the program offers a very flexible way of controlling output.

It also has the added attraction of handling graphics codes as well and disallowing coloured backgrounds.

I think this is essential as, otherwise, the background and foreground may well be the same colour.

The only disadvantage of my method is that it will not work with any programs which use the page of memory starting at &900, as this is where the machine code is stored. – **Andrew Moulden, Portrush, Co. Antrim, N.I.**

● This will certainly save memory if colour changes are required within programs, but the main object of the original routine was to run it before other programs to leave the micro in a one colour state and it would therefore not cause memory problems.

Ensure that the one colour mode is off before using *COLOUR or the micro crashes.

```
 10 REM  ONE COLOUR MODE 7
 20 REM  by Andrew Moulden
 30 REM (c) Micro User 1987
 40 REM ===================
 50 wrchv=&20E
 60 mem=&70:osargs=&FFDA
 70 FOR L%=0 TO 2 STEP 2
 80 P%=&900
 90 [OPT L%
100 LDA #1
110 LDX #mem
120 LDY #0
130 JSR osargs
140 LDY #0
150 LDA (mem),Y
160 STA byte
170 SEC
180 SBC #48
190 CMP #8
200 BCS error
210 CMP #0
220 BEQ error
230 CLC
240 ADC #128
250 STA byte
260 JSR savev
270 .setup
280 LDA #mcode MOD 256
290 STA wrchv
300 LDA #mcode DIV 256
310 STA wrchv+1
320 RTS
330 .savev
340 LDA wrchv
350 STA oldv
360 LDA wrchv+1
370 STA oldv+1
380 RTS
390 .byte BRK
400 .error
410 BRK:NOP
420 EQUS "Syntax: COLOUR <1-7>
430 BRK
440 .oldv
450 BRK:BRK
460 .mcode
470 PHA
480 CMP #129
490 BCC nochange
500 CMP #135
510 BCC change1
520 CMP #145
530 BCC nochange
540 CMP #152
550 BCC change2
560 CMP #157
570 BCC nochange
580 CMP #158
590 BCS nochange
600 JMP change3
610 .nochange PLA
620 JMP (oldv)
630 .change1 PLA
640 LDA byte
650 JMP (oldv)
660 .change2 PLA
670 LDA byte
680 CLC
690 ADC #16
700 JMP (oldv)
710 .change3 PLA
720 LDA #32
730 JMP (oldv)
740 ]
750 P%=&9A0
760 [OPT L%
770 LDA wrchv
780 CMP #mcode MOD 256
790 BEQ check
800 .back
810 JSR savev
820 JMP setup
830 .check
840 LDA wrchv+1
850 CMP #mcode DIV 256
860 BNE back
870 LDA oldv
880 STA wrchv
890 LDA oldv+1
900 STA wrchv+1
910 RTS
920 ]:NEXT
930 *SAVE COLOUR 900+100"
```

Program I: One Colour, Mode 7

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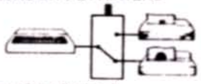
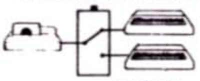
SWITCHING UNITS:

1 MICRO INTO 2 PRINTERS



1 PRINTER INTO 2 MICROS



BBC Printer 2 to 1 (Inc Lead)	@ £30.00	£34.50d
BBC Printer 6 to 1	@ £71.00	£81.65d
Centronics 2 to 1 (Inc Lead)	@ £33.00	£37.95d
Centronics 4 to 1	@ £70.00	£80.50d
Printer 2 to 2 'CPX2 Fully Buffered'	@ £60.60	£69.69b
User Port 2 way & Off Posn (Inc Lead)	@£33.00	£37.95d
User Port 6 way & Off Posn (Inc Lead)	@ £72.00	£82.80d
RGB Switcher 2 to 1	@ £20.20	£23.23d
RS423 2 to 1	@ £20.20	£23.23d

MORLEY ELECTRONICS PRODUCTS:

Teletext Adaptor ATS Software on ROM	@ £106.00	£121.90d
Eprom Programmer Software on ROM	@ £30.00	£34.50d
CARE Deluxe Eprom Programmer capable of programming C'mos & Standard Eproms 2716, 2732, 2764, 27128 &27256 Software on ROM	@ £33.00	£37.95d

Watford Electronics

Acorn
The choice
of Experience

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774-40588 Tlx: 8956095 Fax: 01 950 8989
BY POPULAR DEMAND OUR SHOP IS NOW OPEN UNTIL 8PM EVERY THURSDAY
All prices exclusive of VAT; subject to change without notice & available on request.

The choice after
the Experience

Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

BBC MASTER 128K Micro	**£395**
BBC MASTER TURBO 4MHz	**£493**
512K Processor Add on Board "inc. Mouse and GEM package"	**£195**

SPECIAL OFFER

FREE . . . £80 worth of Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and ***Acorn's*** *popular* ***MUSIC 500*** *Unit with every BBC Master 128K Micro bought from us.*

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled softwares.

System 1	Standard Package	**£385**
System 1A	System 1 + TV Modulator	**£399**
System 2	System 1 + Green Hires Monitor	**£469**
System 3	System 1 + Medium Res Colour Monitor	**£599**

RS232 Kit for BBC Compact		**£26**
Additional 3½" Drive for BBC Compact		**£99**
Turbo 65C102 Add-on Module		**£99**
BBC MASTER ET (Econet Terminal)		**£315**
Econet Module for the Master		**£43**
ROM Cartridges for Master		**£11**
Reference Manual I	(No VAT)	**£14**
Reference Manual II	(No VAT)	**£14**
Advance Ref. Manual	(No VAT)	**£19**
64K Upgrade Kit for B+		**£32**
Acorn 1770 DFS Kit complete		**£42**
ECONET Upgrade Kit for BBC		**£42**
ALL ECONET UPGRADES Available		
Z80 Acorn 2nd Processor package		**£325**
ARIES' Professional IEEE Interface		**£265**
Acorn IEEE Interface Complete		**£280**
Acorn Teletext Adaptor		**£95**
Acorn Bitstick I		**£299**
Robocom Bitstick II		**£759**
Upgrade for Bitstick I to II		**£450**
Bitstick Multiplotter Driver		**£65**

(Securicor carriage £7)

CENTRONICS GLP & Brother M1009 (NLQ) Printers

A major price break-through in NLQ Printers from Watford.

At last, a low cost full feature printer,supplied complete with Watford's own NLQ ROM (separately at no extra cost). Due to Watford's bulk purchasing power and low margins we can now offer this incredible printer deal direct from the manufacturers to our customers.

Features include, Epson RX Compatible commands, Near Letter Quality print, 50 CPS Draft mode, Centronics parallel interface, Single, Double & Quadruple density graphics modes, Subscript & Superscript, handle up to 9½" wide standard paper, Friction Feed standard, Low cost Tractor feed optional extra, Bi-directional logic seeking.

Special Offer ***£95*** *(carr £5)*
Tractor Feed Attachment ***£12***

CO-PRO Adaptor

CO PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£50.00 (carr £5)

VARIOUS PRINTERS

● FX80/85 Tractor Feed	**£35**
● EPSON FX800 Printer	**£315**
● EPSON Hi-80 Printer Plotter	**£229**
● Hi-80 Refils, set of 4 Pens	**£6**
● EPSON Paper Roll Holder	**£17**
● EPSON LX86 Printer	**£199**
● EPSON LX80/86 Tractor Feed	**£20**
● EPSON LX80/86 Sheet Feeder	**£49**
● EPSON FX800 Printer	**£315**
● EPSON FX1000 Printer	**£439**
● EPSON EX800 Printer	**£405**
● Colour option for EX800/1000	**£55**
● EPSON LQ800 Printer	**£439**
● Centronics Printer Cable to interface all the above Printers to BBC	**£6**

(Securicor carriage charge on printers £7)

PRINTER SHARERS

(Ideal for School environment)

Connect 3 BBC Micros to 1 Printer	**£60**
Connect 6 BBC Micros to 1 Printer	**£99**
PRINTER CHANGER	
Connects 3 Printers to 1 Micro	**£65**

(Cables extra)

Acorn-Olivetti JP101 Spark Jet Printer

One of the main problems with most printers is that they are hopelessly noisy. How often have you wanted to print something late at night but not done so for fear of waking the children? Also ideal for those working in quiet environments such as libraries, etc. Silence the complaints with the serious solution from Watford at the amazing cost of only **£59**

Pack of 4 refills **£10**

JP101 accepts 9½" standard fan fold paper or single A4 sheets. Tractor & Friction feed supplied as standard – print speed 50 cps.

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £2.90
27128-250nS £3.25

RAMs (Low power) for ATPL, WATFORD, etc., Sideways ROM Boards

6264LP (8K) £2.80
2 × 6264LP (16K) £5.50

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer	**£269** (carr £7)
Kaga KP915 Printer	**£369** (carr £7)
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

RS232	**£27**	RS232 + 2K Buffer	**£55**
IEEE 488	**£65**	RS232 & 8K Buffer	**£75**

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

Standard length (4 feet long)	**£6**
Extra long (6 feet long)	**£8**
Compact's Special Centronics Lead	**£9**
RS232 Cable	**P.O.A.**
IBM Parallel 1 metre Cable	**£12**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	**–**	**£3.50**
BBC Master	**–**	**£4.00**
Brother HR15	**£3.00**	**-**
FX100	**£7.00**	**-**
FX80-MX80-FX85	**£4.50**	**£4.95**
RX80	**£4.50**	**£4.50**
LX80	**£4.00**	**£4.50**
GP80	**£4.50**	**£4.00**
Centronics GLP	**£4.00**	**£3.75**
KAGA KP810	**£5.25**	**£4.75**
CANON PW1080	**£5.25**	**£4.75**
Panasonic KX1080	**£7.75**	**£4.75**
Microvitec Metal Monitors	**–**	**£5.50**

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	**£7**
2,000 Sheets 9½" × 11" Fanfold Paper	**£12**
1,000 Sheets 15" × 11" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

Carriage on 1,000 Sheets £1.50

PRINTER LABELS

(On continuous fanfold backing sheet)

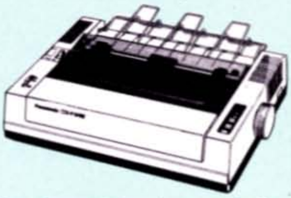
1,000	90 × 36mm (Single Row)	**£5.00**
1,000	90 × 36mm (Twin Row)	**£4.90**
1,000	90 × 49mm (Twin Row)	**£7.50**
1,000	102 × 36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

NEW

Panasonic KX-P1081

(Now IBM Compatible)



from the prodigious Japanese Stable of Panasonic comes this fabulous new NLQ Dot Matrix Printer

Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy **120 cps** of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

The draft text is implemented with a 9 × 9 matrix, with Near Letter Quality effected by means of an 18 × 18 matrix.

(Price inludes, FREE A 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £7)

Panasonic RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

A few months ago, we introduced the KX-P1080 to our large and discerning customer base. As a result of the enthusiastic and overwhelming reaction to this versatile dot matrix printer (see above for details), we are now extremely pleased to be able to bring you details of the fabulous KX-P3131 Daisywheel Printer, also from Panasonic. The KX-P3131 printer is the ideal printer for the home user wishing to produce clear, immaculate letters or reports.

Ideally suited to the pocket of the home user, costing not much more than a pair of disc drives, this daisywheel printer delivers flawless text at 10, 12 or 15 characters per inch. It also supports proportional print mode.

Printing at a respectable 17 characters per second, the KX-P3131 features a capacious 6 kilobytes printer buffer to swallow most printing requirements with ease. For the more demanding user, there is a 32 kilobytes printer buffer option available. Taking paper up to 13.5" wide, the KX-P3131 prints with bidirectional logic seeking, ensuring the minumum time to print your text.

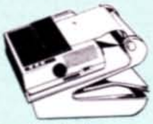
Only **£218** (carr. £7)

Single Sheet Feeder	**£195**
Tractor Feed	**£90**

256K PRINTER BUFFER
Only: £149

(For full details on this extremely versatile, low cost – high performance Mega Printer Buffer please refer to page 3 of our advert.)

Printer Stand Type-YU-S25



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

***Introductory Offer* Only £29**

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with connecting lead.

MICROVITEC 14"

● 1431 – Medium resolution as used on the BBC television computer programme	**£175**
● 1451 – High resolution, suitable for word processing in mode 0	**£225**
● 1441 – High res, exceeds the capabilities of the BBC micro	**£359**
● 1431AP RGB + PAL and AUDIO	**£199**
● 1451AP RGB + PAL and AUDIO	**£255**
● Dust Cover for Microvitecs	**£5.50**

KAGA-TAXAN 12"

● KAGA KX1201G Hi-res Green Monitor	**£85**
● KAGA KX1202G Long persistence Hi-Res Green Monitor	**£93**
● KAGA KX1203A Ultra-Hi-Res Amber Monitor	**£93**
● KAGA Super Vision 2 Hi-res RGB Colour monitor. Ideal for Wordprocessing	**£260**
● **Kaga Super Vision 3,** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue	**£309**
● 12" Anti-Glare Screens	**£9.50**

STAR BUY

- PHILIPS 14" Hi-Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono connectors. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display.

ONLY £209

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res	**£69**
Amber (New Design) Hi-res	**£74**

LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for KAGA	**£3**

N.B. carriage on Monitors **£7** (securicor)

SWIVEL BASES

for Video Monitors

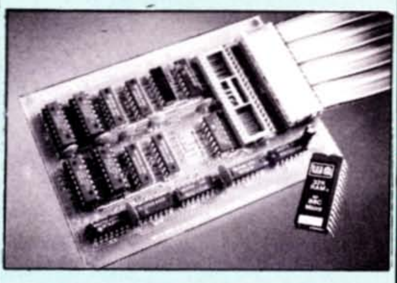
By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

32K

SHADOW RAM-Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Ensure COMPATIBILITY with a vast range of hardware (including our ROM board, the ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, Music 500's AMPLE). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable and has the power consumption of a couple of ROMs!

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages, and a comprehensive manual is supplied free.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

See next page for SPECIAL OFFER

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

Continued ⟶

INCREDIBLE WORD PROCESSING DEAL ! ! !

Watford Electronics, already renowned for quality products at discount prices, are offering, the truly spectacular BARGAIN OF THE YEAR!

A Watford's 32K Shadow RAM Card – Printer Buffer and the much sought after, Computer Concepts' Inter-WORD, (a very powerful package) All this at an astounding price of:

Only £89 (carr £3)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED (BOOK)

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, Canon PW1080A or any Epson FX80 compatible Printer with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

Superb Value at **£5.95** (No VAT)

NOW WITH EXTRA FEATURES AT NO EXTRA COST
Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities ten simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for four years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS).***

PRICES

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£62**
- *Acorn's 0.90 DFS Kit complete* **£57**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£46**
- *DDFS Manual* *(no VAT)* **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£29**

NEW MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £2)

BBC MICRO BUSINESS/ WORDPROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). Please telephone or call in at our retail shop to discuss your particular requirement and a demonstration.

EXAMPLE PACKAGE

BBC Master 128K Micro, View wordprocessor, Viewsheet, Basic Editor, Terminal Emulator, Twin 800K 40-80 track double sided Disc Drives, Zenith Hi-Res green monitor, Panasonic KX-P3131 professional quality Daisy Wheel printer, Gemini Database, Spreadsheet, Beebplot Graphics, Cashbook, Final Accounts, Mailist, Easiledger, Invoice & Statements, and Stock Control packages on disc with manuals.

Only £899

A Low Cost wordprocessing package: Same as above except, a single disc drive instead of a twin and Olivetti Spark Jet Printer instead of Panasonic.

Only £625

MYSTERIES OF DISC DRIVES & DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

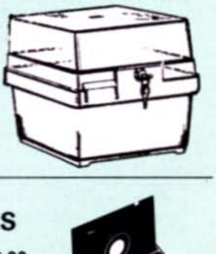
Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket. **£4**

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. **£8**

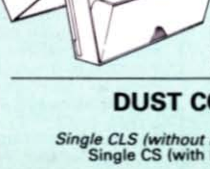
ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection –
Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

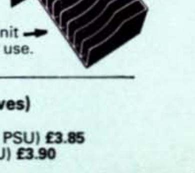


● M35 - holds upto 50 discs	£8
● M85 – holds upto 95 discs	£9
● M50 – holds 50 3½" Discs	£10

PLASTIC LIBRARY CASES



Holds up to 10 5¼" Discs. **Only £2.00**



DX-08: This extremely handy unit holds up to 8 5¼" Disc while in use.
Only £2.00

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20**	Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95**	Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our drives are of Japanese manufacture. All our 80 track drives are already fitted with a 40-80 select switch.

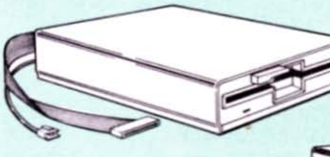
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

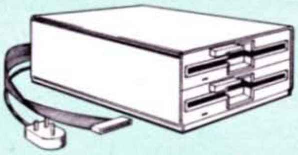
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below for single drives is for a single drive in a standard single case. Single drive in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 10th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.





Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £95		CS 200 £108	
400K (720K)	CLS400S £96	CLD 400 £180	CS 400S £109	CD400 £200
800K (1.44M)		CLD 800S £183		CD 800S £204

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

Prefix ***C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

Suffix ***S** = 40-80 Switchable*

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40-80 track).

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● *10 × 5¼" S/S D/D 40 Track Diskettes*	***£10***
● *10 × 5¼" D/S D/D 40 Track Diskettes*	***£12***
● *10 × 5¼" S/S D/D 80 Track Diskettes*	***£15***
● *10 × 5¼" D/S D/D 80 Track Diskettes*	***£15***
● *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT*	***£30***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£18***
● *10 × 3½" D/D D/D 40/80 track Discs*	***£22***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● *10 × **M3** 3½" D/S D/D 80 Track Discs*	***£20***
● *10 × **M4** 5¼" S/S D/D 40 Track Discs*	***£9***
● *10 × **M5** 5¼" D/S D/D 40 Track Discs*	***£11***
● *10 × **M7** 5¼" D/S D/D 80 Track Discs*	***£14***
● *3" Double Sided Discs*	***£3** each*

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	**£46**	**£49**	**£72**
● With Sleeves	**£49**	**£52**	**£75**

ACORN WINCHESTER DRIVES

Suitable for direct connection, via the 1MHz bus, to any BBC running ADFS. These Acorn Winchester disc drives are fast and extremely reliable. Each Winchester comes complete with the Level III Econet File Server software.

10 Megabytes **£1050; 30 Megabytes £1549**

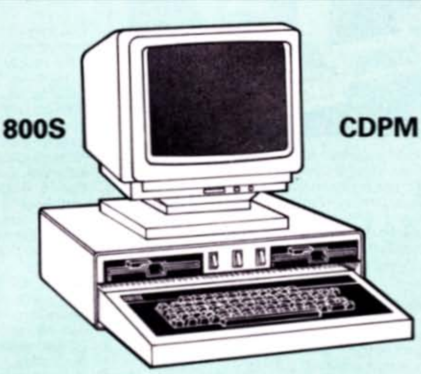
WATFORD's WINCHESTER DRIVES

● 20 Megabytes with ADFS	**£635**
● 40 Megabytes with ADFS	**£999**

WINCHESTER WORKSTATION

20 Megabyte Winchester, plus a Tape Streamer and a 400K Floppy Drive all housed in a plinth with cooling fan **£1499**

CDP 800S

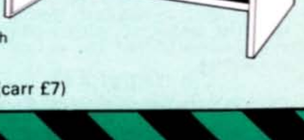


CDPM 800S

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

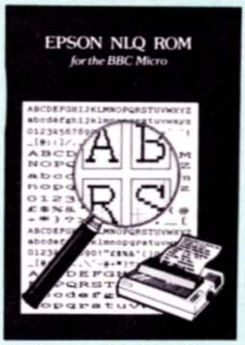
CDP 800S for BBC Micro £210 **CDPM 800S for Master £225**
(Securicor Carr. £7)

ACORN'S Twin 800K Disc Drives



Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.

RRP £250 **Our Price: Only £199** (carr £7)



Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM **£7**

THE NLQ DESIGNER

(The First & still the Best)

SPECIAL OFFER this Month:

Supplied with over 25 Different fonts

A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.

Supplied with disc containing over 25 example fonts. Please specify 40 or 80 track. Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)

- *NLQ Designer ROM & FONT Disc* ***£25***
- *Kaga Individual FONT ROMs* ***£10***

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics. Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- *Vertical and horizontal scaling in all graphics modes and mode 7*
- *Rotation of image by 90, 180 or 270 degrees*
- *Left hand margin setting*
- *Screen dump window setting*
- *Colours appear as grey scale*
- *Two tone fast dump*
- *Colour mask*
- *Mode 7 contrast expansion*
- *Mode 7 contiguous dump*
- *Key triggered and User Port triggered dumps*

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

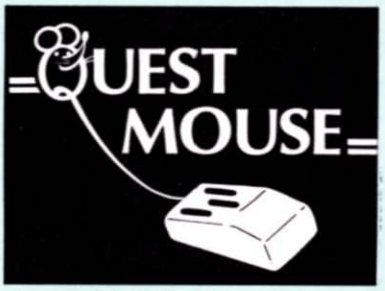
For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally and compatibles.

Only: £25

(Write in for further details on all above ROMS)

NEW



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse. This package must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist looking for the most powerful drawing program around.

The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that programs such as AMX Pagemaker etc. will work with it. The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford Quest Paint software and so that worn out mice can be replaced for minimum cost.

The Mouse features high resolution 50 PPI operation. It has a rubber ball for maximum accuracy and has three buttons to allow a massive range of options to be accessed without touching the keyboard.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard. The software is carefully designed to provide all the features needed by the budding artist. It is the nearest we can get to using paintbrush, airbrush, pencil and rubber on your computer screen.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. For a full leaflet describing the software in full detail please write to us.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, dither pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or centre spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size change. Trace round areas of colour. Zoom for fine editing. Compatible with screens from Watford Beeb video digitiser. Load and Save screens with colour palette information, save brush and pattern definition etc.

SPECIAL INTRODUCTORY OFFER

QUEST MOUSE & QUEST PAINT	***£59***
QUEST MOUSE ONLY	***£35***
MOUSE MATS	***£5***
QUEST PAINT SOFTWARE	***£34***

(Quest Paint supplied complete with Software in a 32K ROM, User Guide and Utility Disc)
(PS. The Watford Quest Mouse is FULLY Compatible with the AMX Mouse, therefore all AMX Software will work perfectly with it)

By popular demand our retail shop is now open until 8pm every Thursday

NEW

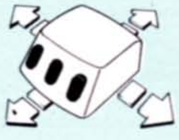
MARK II LIGHT PEN + PENPAL 2

The Watford Electronics Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Penpal II, Watford Electronics' sophisticated light pen software is also supplied free on cassette or disc (please specify). This is a highly sophisticated drawing package enabling you to gain the maximum benefit from your Light Pen. The software is used to edit Mode 2 full colour screens using lines, patterns and you own designs. Screens may be saved to cassette or disc.

Price Only £15

THE AMX MOUSE



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £63 (carr £1.50)
(Please specify for BBC or Master Computer)

We are giving away, absolutely **FREE,** our popular Colour Art software package worth **£15** with every AMX Mouse package purchased from us.

AMX MAT	**£5**
AMX MOUSE ONLY	**£35**
AMX DESK Package	**£19.00**
AMX UTILITY Package	**£11.00**
AMX SUPERART Package	**£39**
AMX PAGE-MAKER Pack – A desk-top publishing software. It Works with keyboard, joystick and a mouse	**Only: £32**

We are giving away, absolutely FREE, PAGE-FONTS, a disc containing over 20 fonts, with every purchase of AMX PAGE-MAKER from us.

PAGE-FONTS Over 20 fonts for use with AMX PAGE-MAKER	**£9.50**
EXTRA EXTRA	**£19**
AMX 3D ZICON Disc	**£19**
AMX Database Disc	**£19**
AMX XAM Educational	**£19**
AMX MAX(A gem of desktop (ROM)	**£17**

RB2 MARCONI TRACKER BALL

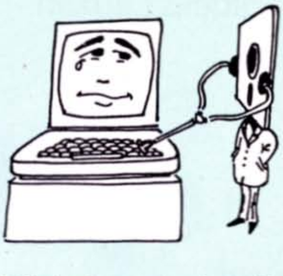
This popular unit is supplied complete with software.
Price: **£59**

FLEET STREET EDITOR

Software pack **£35**

Admin Xtra Disc Utility	**£14.95**
Walt Disney Disc Utility	**£14.95**
Fonts N Graphics Disc Utility	**£14.95**

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BBC SOFTWARE'S
Popular Educational Software

● Maths with a Story 1 (Cassette). 4 primary level maths programs	£10.95
● Maths with a Story 2 (Cassette) 4 further maths programs	£10.95
● Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs	£19.95
● WAVES: Science Topics (Disc) CSC O Level Physics program.	£14.95
● RELATIONSHIP: Science (Disc) O Level Biology program.	£14.95
● BONDING: Science (Disc) O Level Chemistry program.	£14.95
● ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program.	£14.95
● ELECTRONICS IN ACTION (Disc) O Level program	£14.95
● NEWTON & THE SPACE SHUTTLE (Disc) O Level program.	£20
● ECOLOGY (Disc) O Level program.	£20
● POLYMERS (Disc) O Level program.	£20
● Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule.	£20
● FOOD & POPULATION (Disc) O Level program.	£20
● MICROTECHNOLOGY (Cassette) O Level program.	£6.95
● A VOUS LA FRANCE (2 Cassettes) A French language home study aid.	£17
● DEUTSCH DIREKT! (Disc & Audio Cassette)	£20
● Modem Master (Disc)	£11.25

TED

The Teletext Editor Package for serious users

TED is the brand new package from Watford Electronics for the editing and creation of teletext (Mode 7) screens and displays. TED is ideal for anyone wanting to create their own Mode 7 pictures (such as game title pages), designing animated displays for shop windows, exhibitions, classrooms, etc. TED is also probably the most powerful Prestel screen editor you will ever come across.

Supplied on a special 32k package, full facilities are providing for manipulating the screen, including easy to use pixel manipulation; line, column and block buffering and copying; left and right margins; large text in a variety of different fonts (contained within the ROM device); various borders and effects templates (contained within the ROM device); line and column insertion and deletion; easy to use graphics line drawing. Those are some of the features of editor itself. In addition to this, TED contains routines for taking a number of Teletext screens and creating them into an animated sequence, with user selectable display times, repeats on a group of shows, various entry methods (how the picture is put onto the screen), routing selection (both predefined and keyboard specific), chaining of other shows, etc. Scrolls treat the Teletext sequence as a very long page with a window onto it. Supplied complete with a comprehensive manual. There are many more facilities not mentioned here, so write in for a comprehensive leaflet; you'll wonder how you managed without TED.

Price: £35

ROM-SPELL

"way ahead of any competition"

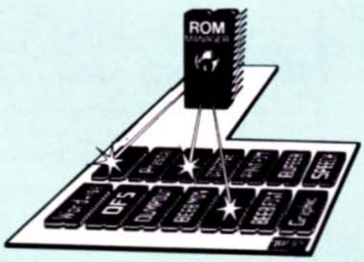
ROMSPELL
ENGLISH DICTIONARY

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

NEW

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sofisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

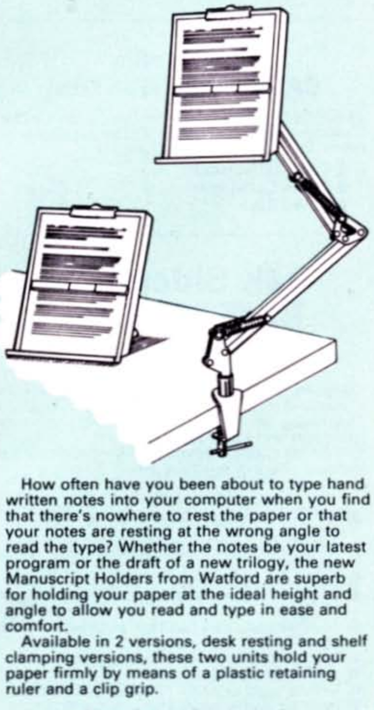
Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degredation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24**.

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

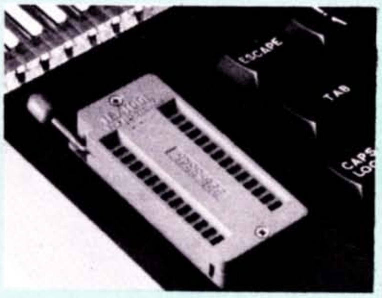
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

All prices in this advert are exclusive of VAT.

Continued →

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

- The low profile of the socket allows unrestricted access to the Keyboard.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

16K DISC RAM

Unlike other RAM boards, this revolutionary, battery backed up, write protectable 16K sideways RAM board allows you to run from disc every sideways ROM available.

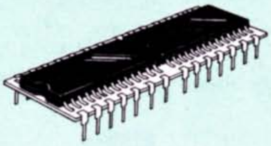
Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £32 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

SOLID STATE 16K SIDEWAYS RAM



This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. ***Compatible with BBC B Plus.*** Like our other 16K RAM Modules, this unit is very simple to fit.

Only **£28** (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

Do you find the 16K Sideways RAM Units confusing? If so, we have compiled this quick questionnaire to help YOU decide which is the best one for you. If the answer to any of the questions is yes, then use the index number to select from the boards below. Options in brackets indicate possible secondary choices.

Do you require:

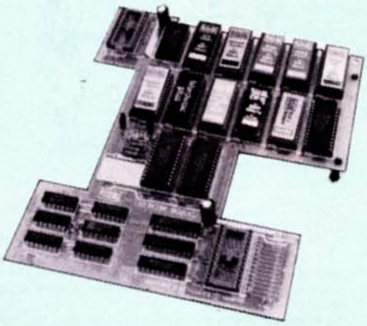
- Sideways RAM for a BBC B+
  Choose 1, 2 or 3.
- Sideways RAM for the B+? Choose 3.
- A small, basic module? Choose 3.
- A sideways RAM module for a ROM board? Choose 1 or 3.
- More than one module installed at once? Choose 1 or 3.
- To use sideways RAM as a printer buffer? Choose 1 or 3.
- Battery Backup? Choose (1) or 2.
- Write protect for RAM (makes ROM look like RAM)? Choose (1) or 2.
- Read protect (allows recovery from crashes)? Choose 1.

Key:
1) 16k Sideways RAM Module
2) 16k Disc RAM
3) Solid State 16k Sideways RAM
4) Options in brackets indicate optional extras.

GRAPH PAD 2

Supplied complete with Software
£60 (Carr. £3)

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

NEW

The BBC B+ Micro ROM EXPANSION BOARD

Specially designed for all BBC Plus users, this board sits in an external box, and will accept either 10 off 16k EPROMs, OR 10 off 32k EPROMs.

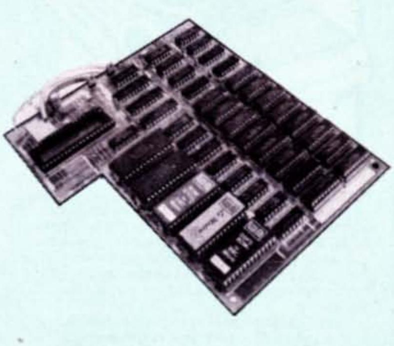
With the 32k EPROMs, only 5 can be 'online' at once (that's all the B+ can address, as each chip 'holds' two normal sockets worth), but you can swap between the two banks if necessary. With the 16k EPROMs, you can obviously address them all at once. An extra card can be added to permit 2 banks of 10 EPROMs to be used (again with only one bank available at once).

The ROM box, which has its own mains power supply, and connects to the BBC Plus via a specially designed card (which is a buffered card for your peace of mind) permits easy access to the EPROMs via the hinged lid. NO soldering is required for this board.

£79 (carr £2)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

● *ROM/RAM card with 32k dynamic RAM*	***£39***
● ROM/RAM card with 64k dynamic RAM	***£52***
● ROM/RAM card with a massive 128k dynamic RAM	**£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

● *16k plug-in Static RAM kit*	***£6***
● *16k Dynamic RAM for Upgrade*	***£7.50***
● *Battery backup*	***£3***
● *Read and Write protect switches*	***£2** each*
Complete ROM-RAM board (all options installed)	***£89***

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***
- *BT Approval applied for.*

(When ordering, please specify the version required, (BBC or Master)

SPECIAL OFFER

Price: **£74**
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£85

(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software	**Only £75**
COMMSTAR ROM package only (P&P on modem £2.00)	**£29**
Auto Dial Utilities Disc	**£9.50**

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Special Launch Price: **£75**
(Carr £3)
(Write in for full specification)

BT TELEPHONE CONNECTORS for Modems

LJU 1/4A Mini Line Master	**£4.50**
LJU 1/6A Mini Line Slave	**£3.00**
LJU 2/4A Line Master	**£4.00**
LJU 2/6A Line Slave	**£2.50**
LJU 3/4A Flush Master	**£3.95**
LJU 3/6A Flush Slave	**£2.75**
LJU 10/3A Dual Splitter	**£5.50**
4 Way BT Plug	**£0.75**

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued ⟶

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus

WORDWISE PLUS
£40

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: **£5**

SPELL MASTER £49

Inter SHEET ONLY £37

INTER-CHART **ONLY: £26**

Inter-WORD

Only: £42

Special Discount price for the existing Wordwise Plus owners. Simply quote your reg. number and pay.

Only: **£39**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	**£37**

VIEW 3.0 ROM

Price: Only **£54**

HI-VIEW (for use with 6502 2nd Processor)	**£36**
VIEW Printer Driver Generator Please specify Disc or Cassette)	**£9**
VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£22**
VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2 for the Master	**£85**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£10
Juki & Brother HR15 (Disc)	£10
Silver Reed Printers (Disc)	£10

Micros in Business (Disc)
An introduction to Business software for the BBC Micro from Acorn **£43**

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit	£29
Adv 1770 DFS for Mast/Compact	£29
Adv 1770 DFS for BBC/BBC+	£29
Adv Disc Investigator	£24

MINI OFFICE II (disc) **£14.50**

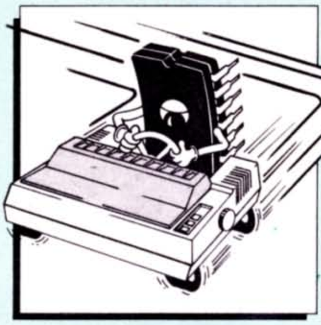
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering. Only **£20**

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!

ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8
P.S. This includes the Acorn 6502 & Z80.

A give away at . . . **Only £29**

Please specify 40 or 80 track disc when ordering.

ARIES CORNER

Aries B-32 Shadow RAM Card

18 months of intensive research and development have produced a worthy successor to the widely acclaimed Aries-B20: the revolutionary Aries-B32. This 'second generation' expansion board features 32k of RAM and a 16k ROM socket.

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: B-32 **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries B-20 and the Aries B-32. For the business user or educationalist, the compact and secure internal fitting is ideal, with the ROM board tucked neatly inside the lid where it will not cause overheating problems. The serious software developer and the hobbyist may prefer to mount the board externally, giving instant access to the sockets for experimental purposes. A zero-insertion force (ZIF) socket may be fitted to the board to enhance this mode of operation.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable 'mother board' which carries the extension ROM sockets and a small 'base board' on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have an B32 or B20, a small adaptor module (the Aries B-12C) is available at a nominal cost. The 6264 static RAM chips used to provide the sideways RAM are advertised elsewhere in our advert.

Price:
Aries B-12 **£40.** Aries B-12C **£5**

THE ARIES RANGE HARDWARE REQUIREMENTS

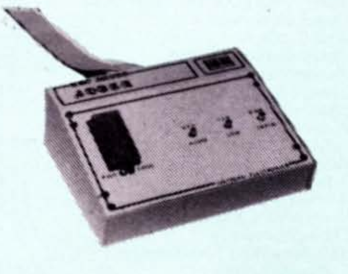
Aries B-32 & BBC B, MOS 1.20, hardware plugs into CPU socket.
Aries B-12 & BBC B, MOS 1.20, hardware plugs into all four sideways ROM sockets and connects to the B32 or the B20. The adaptor Aries B-12C module is necessary where these are not fitted.
Aries B-488 BBC B, MOS 1.20, Hardware plugs into 1MHz Bus.

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

Aries B-488 Unit: **£238** (Carr £3)

ADDER



Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs:
From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£65

TEX EPROM ERASERS

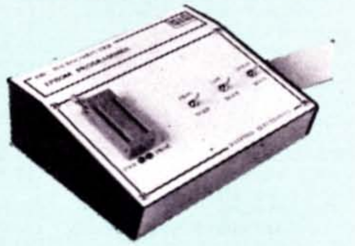
EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

VISA

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234-33383

EPROM PROGRAMMER



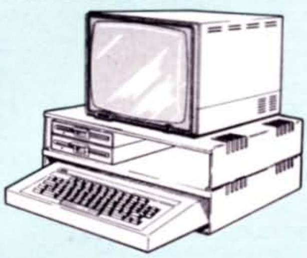
The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette-disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69 (£3 carr.)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£20** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£25** (carr £2.00)

Continued →

BOOKS (No VAT on Books)

15 Hrs Word Processor Using BBC	£3.95
30 Hour BASIC (BBC Micro)	£7.95
40 Best machine Code Routines	£7.95
50 Programs in BBC BASIC	£6.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development System	£7.50
6502 Machine Code for Humans	£7.95
6502 Reference Guide	£9.95
68000 Assembly Lang. Programming	£19.95
68000 Machine Code Programming	£13.00
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£16.95
Art of Music Graphics	£14.95
A User Guide to Wordwise Plus	£9.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£16.95
Advanced BASIC ROM User Guide	£9.95
Advanced User Guide for BBC	£13.95
Advanced FORTH	£9.95
Advanced Graphics with BBC	£9.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Applied Assembly Lang. for BBC	£9.95
Assembler Routines for the 6502	£7.95
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Language Programming on the BBC & Electron	£8.95
Basic ROM User Guide	£11.95
Basic User Guide for BBC Micro	£10.00
BBC B Compendium	£5.95
BBC B+ User Guide	£14.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & the small Business	£5.75
BBC Micro ROM Book	£10.95
BBC Master 128 High Flyer	£10.95
BBC Micro Advanced Ref. Guide	£10.95
BBC Micro Disc Companion	£8.95
BBC Micro File Handling on	£6.95
BBC User Guide	£10.00
BBC Software Projects	£6.95
BBC Wordprocessor Beginners Guide	£7.95
BBC Within the Micro	£13.95
BCPL User Guide	£14
C for Programmers	£9.95
Complete FORTH	£6.95
CP-M-86 User's Guide	£19.95
CP-M Bible	£16.50
CP-M Handbook with MPM	£9.95
CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£9.95
Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
FORTH on the BBC Micro	£7.50
Functional Forth for the BBC Micro	£5.95
Guide to BBC ROMs	£9.95
Graphics for Children	£6.95
Graphs & Charts on BBC Micro	£7.50
Hackers Handbook - New	£6.95
Inside Information (Computers, Communications & People)	£8.95
Interfacing & Robotics on BBC	£15.95
Introduction to COMAL	£9.50
Introduction to LOGO	£6.95
Introducing 'C'	£9.95
Introducing LOGO	£5.95
Introduction to FORTH	£8.95
Introduction to PASCAL	£17.95
ISO-PASCAL Reference Manual	£9.95
LISP 2nd Edition	£14.95
LISP, A Beginners Guide to	£10.95
LISP the Language of Artificial Intelligence	£9.95
Logo Programming	£9.95
Mysteries of DISC DRIVES and DFS REVEALED	**£5.95**
Mastering Assembly Code	£8.95
Mastering CP-M	£17.95
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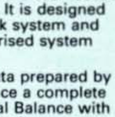

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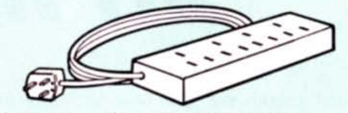

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ORDER VIA MicroLink 72:MAG030

Mike Cook provides the finishing touches to his DIY video digitiser

Reflections on an image

LAST month we saw how to make an extremely low-cost video digitiser and this month we will see what we need in the way of software to drive it. But first let's have a second look at the hardware.

Nothing stands still for very long, and I have already come up with a way to improve the circuit described last month. On detailed analysis of the pictures I was getting, I noticed a few odd rogue values that should not have been there.

What was happening was that the outputs of the binary encoder were not changing synchronously. This happened when more than two bits in the coded value changed at one time, illustrated in Figure I. This shows the output of the encoder changing from a value of 3 to 4.

Although the sequence happens very rapidly, occasionally the latch signal coincides with this transition and reads in the wrong value.

Fortunately the remedy is quite simple – you need to latch the output of the comparators some time before you need to read in the coded value. This is done using an octal latch and clocking it with the inverse of the signal driving the counters. Figure II shows the modification which is now included in all the Body Build kits for the digitiser.

The digitiser handles black and white pictures using each colour produced by the computer as a different shade of grey. To view the image properly you therefore need a black and white monitor.

If you are using a colour TV set then it is a simple matter to tune slightly off the station to lose the colour. However, for colour monitors I have come up with the circuit shown in Figure III.

It sits between your micro and the monitor, taking the RGB signal from the former and converting it to an analogue signal that is applied to all three guns, thus enabling all you poor wretches with colour monitors to savour the delights of black and white.

Basically the circuit is a simple digital to analogue converter using three different resistor values. The size of the signal, or contrast, can be adjusted by VR1 while the brightness is a DC offset to the signal controlled by VR2.

The program in Listing I will give you a grey scale to allow you to adjust these controls. For your convenience the parts to build this along with a printed circuit board and lead can be obtained as Body Build Pack 43, using the order form on Page 103.

However, some monitors, like the popular Microvitec, will only accept digital signals. Luckily most of these can be converted to analogue operation: On the Microvitec it is just a matter of changing over some links, as shown in Figure IV.

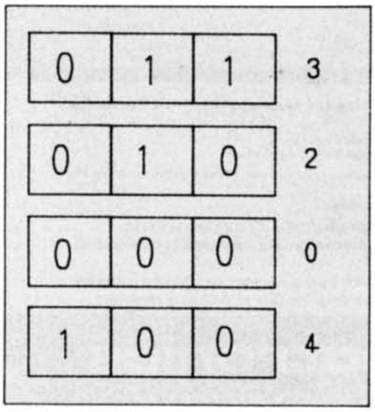
If you change the links the brightness control will no longer function, but the brightness can still be controlled by altering VR2.

Now you are all watching a nice black and white picture it is time for the picture-grabbing software, which is given in Listing II. The part of the program that inputs the picture is, for reasons of speed, written in machine code. Let's see what we need to do.

Basically we must read in one sample per line as shown in Figure V. So to start off we must set the preset counter to grab the samples at the first column. This will not be immediately after the line sync pulse as we will want to be able to centralise our picture with the display. So we clear the preset counter and feed it a number of pulses (stored in memory location &70) to set it at the right point.

Now we must wait until the signal is at the top of the screen. To do this we wait for a frame sync pulse and then count a number of line sync pulses. The value we use is stored in memory location &72, and allows us to centre the picture horizontally. We are now ready to read in the samples of digitised video signal.

We know when a sample has been loaded into the latch because control line CB2 is triggered at the same time.



0	1	1	3
0	1	0	2
0	0	0	0
1	0	0	4

Figure I: Possible transition from pixel value 3 to value 4

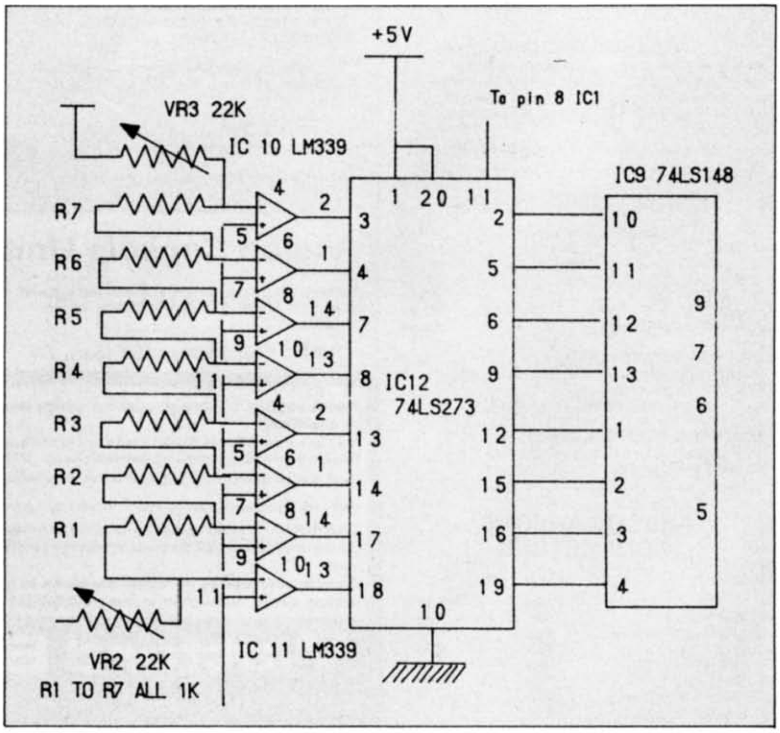


Figure II: Adding a latch to the A/D converter

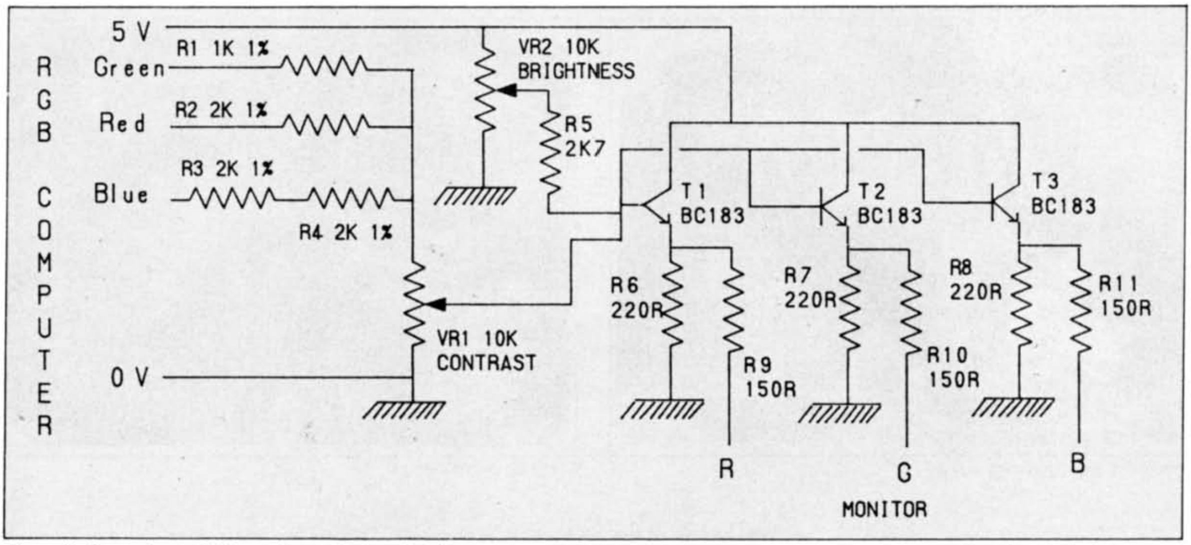


Figure III: Converting an RGB monitor to black and white

So all we have to do is to wait until the flag in the VIAs interrupt control register tells us there is a sample to read. We then read it from the VIA and store it into the display area of memory.

The address of where in the display memory we need to store our sample is held in memory locations &76 and &77, and this is called our pointer. After each sample has been stored it must be moved on to point to the display point directly below the one we have just used.

Most of the time this is done by just incrementing the pointer. However, due to the way the BBC computer arranges its memory every eight samples we have to add the value &278.

We need to repeat this until we reach the end of the display screen, then read in the next column. We set the sample point by incrementing the preset counter.

Then to line up with the previous column we perform the same procedure of waiting for a frame sync pulse and then counting a number of lines. As each memory location on a mode 2 display stores two pixels the second time we access it we need to logical OR our sample with what is already there.

When we read in the next sample we need to add eight to our pointer to move it to the next column of pixels. In fact this is added to the Y index register for simplicity, so when we store our samples in screen memory we simply use the Y offset addressing mode. This process continues until we have read in all the columns. The counter for this is stored in memory location &70.

In addition to reading in a picture it is useful to be able to plot an intensity histogram. This is a plot of exactly how many pixels there are of each intensity. This is important when setting up the digitiser so that you can adjust the controls until you get a picture covering all the possible pixel values.

To acquire the intensity histogram we access the screen directly. This means converting the values found there into straightforward binary numbers.

You will recall that in Mode 2 there are two pixels per byte and these occupy alternate bits. There is an operating system call that reads a pixel but when I used this it took a machine code program 35 seconds to gather the

Turn to Page 98 ►

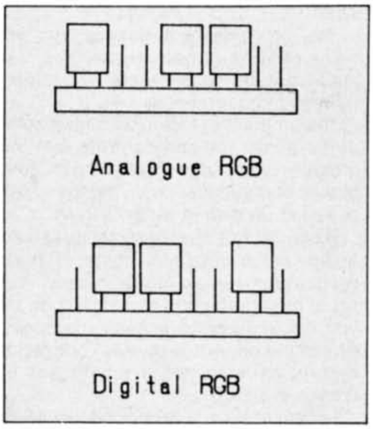


Figure IV: Links to change the Microvitec monitor

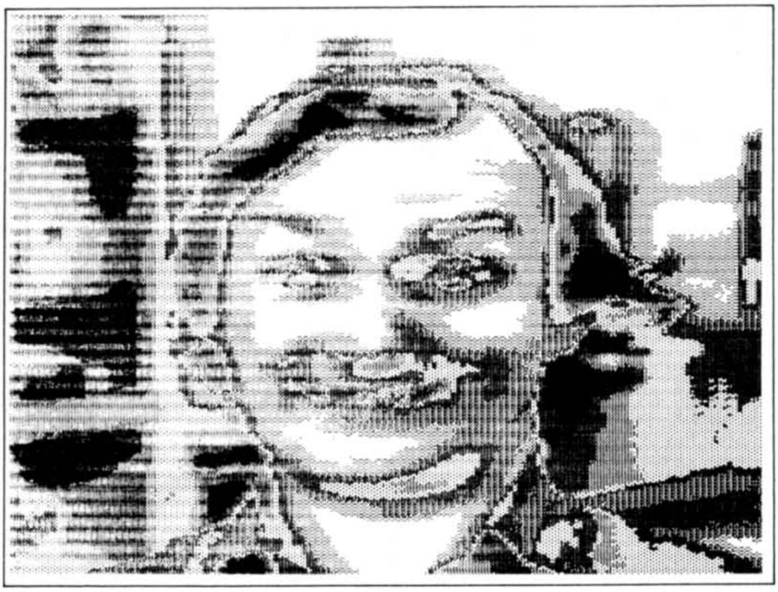


Image I: Me!

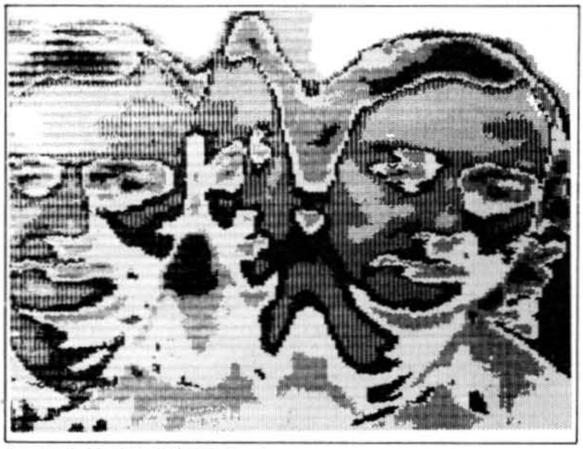


Image II: Moving during a scan

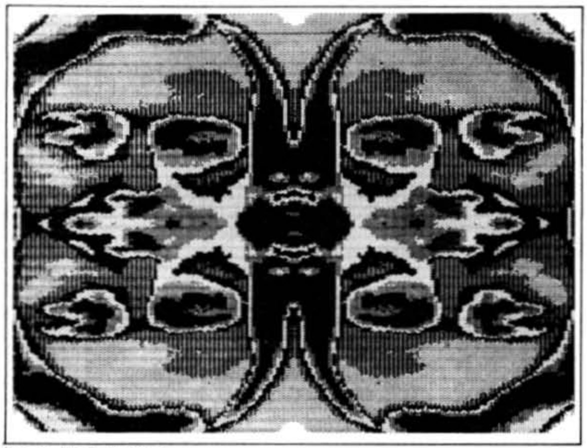


Image III: Reflection

◀ **From Page 97**

histogram data. So I rewrote the program as you see it here, doing the pixel value conversion myself, and it takes just over 3 seconds.

The histogram program looks at each pixel in turn and then – depending upon its value – increments a 16 bit value held in memory locations &80 to &8F.

Having acquired the data a Basic procedure PROC_GRAPH plots out a bar graph. In order not to make a mess of the picture you have just digitised, the bar graph is plotted in pixel values greater than 7 by simply ORing a logic one in the value already there.

To see this against the picture background the palette has been programmed to show white over dark pixels and black over light pixels.

When you press any key the histogram is replotted but this time the most significant bit of the pixel value is cleared by ANDing it with the value 7.

This same trick is used when you want to save the picture to disc. The prompt is written by setting the most significant bit of the pixels to one and then, before the memory is saved, the prompt and your reply are written again, thus clearing the most significant bit.

This works fine as long as you take one precaution: Do not use the delete key. This rubs out the last character completely and image data can't be recovered.

Now with a working system let's see how we can adjust the digitiser to give perfect results. Referring to the full circuit diagram given last month, VR1 controls the speed of the oscillator. Adjusting this will tend to squash or stretch the picture.

Adjusting VR2 and VR3 will control the white and black levels respectively: These are adjusted to give a picture with values in each histogram bar. They are interdependent so a few adjustments might be needed. Also the settings will depend on those of your video source and the lighting conditions.

Changing the values in line 160 and 170 will allow the digitised picture to be centralised or, if you want, shifted, with respect to the video source.

An idea of the sort of results that can be obtained are shown in Image I – this is one of yours truly with a stupid grin.

You can get a subjective improvement of the picture if you view it from a distance and screw your eyes up; this is also a well known way of getting a subjective improvement of me.

Taking a digital picture takes just over three seconds so for the most life-like results the subject should not move. However, Image II shows what can happen if you do. You can get many tricks and special effects by this method.

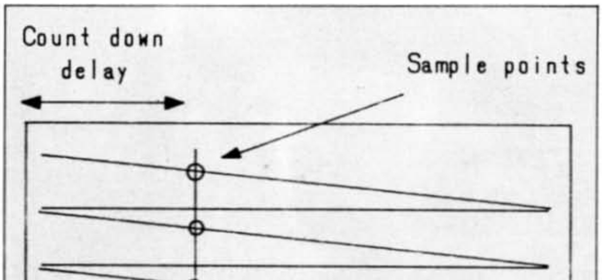
If you want a printout of the picture the best bet is to insert a call to your dump routine in response to a key press at line 1885.

The fun comes with images once you have captured them, when you can subject them to all sorts of manipulations and operations.

The program in Listing III shows some of the things you can do. Note that this program is useful to all of you with other makes of digitisers, providing the image is stored on disc in Mode 2 form.

Basic is not the best language for image processing and some of these procedures run painfully slowly. You could rewrite them in machine code but you would have to access the screen directly and not use any operating system calls to get a significant increase in speed.

Let's just have a brief rundown of the sorts of thing you can do. Reflections are fun to perform on an image, simply



Errors crept into last month's Figure V. Pins 4 and 5 on ic5 should be swapped, as should pins 5 and 6 on ic6.

Figure V: A sampled raster

Listing I

```
   10 REM Grey Scale Test
   20 REM by Mike Cook
   30 REM (c) Micro User 1987
   40 MODE 7
   50 PRINTTAB(0,6);"GREY SCALE TEST"
   60 PRINT"By Mike Cook"
   70 PRINT"PRESS ANY KEY TO CONTINUE"
   80 A$=GET$
   90 MODE 2
  100 RESTORE 150
  110 FOR A%=0 TO 15
  120 READ C%
  130 VDU19,A%,C%;0;
  140 NEXT
  150 DATA 0,4,1,5,2,6,3,7
  160 DATA 0,4,1,5,2,6,3,7
  170 C%=0
  180 FOR X%=0 TO 1280 STEP 160
  190 GCOL 0,C%
  200 MOVE X%,0
  210 MOVE X%,1024
  220 PLOT 85,X%+160,0
  230 PLOT 85,X%+160,1024
  240 C%=C%+1
  250 NEXT
  260 FOR Y%=0 TO 1024 STEP 256
  270 MOVE 0,Y%
  280 MOVE 1280,Y%
  290 PLOT 86,0,Y%+192
  300 NEXT
  310 A$=GET$
```

Get it right!

```
 10 =      0 0 | 120 = AE0F 9 | 230 = FBFE C
 20 =      0 0 | 130 = EC24 1 | 240 = 3AEB C
 30 =      0 0 | 140 = 2C83 5 | 250 = 2C83 1
 40 = 1092 2 | 150 = 3D87 B | 260 = 9CED 0
 50 = D905 7 | 160 = 3D87 F | 270 = 97C1 C
 60 = FC23 1 | 170 = DDEC B | 280 = DDA2 2
 70 = 4716 2 | 180 = 7617 4 | 290 = 3001 E
 80 = 77F2 B | 190 = FD7B 9 | 300 = 2C83 9
 90 = 4037 D | 200 = 6079 6 | 310 = 77F2 F
100 = 5DE2 8 | 210 = 8F9B C |
110 = 97E7 4 | 220 = B335 D |
```

Listing II

```
   10 REM Video Digitiser Driver
   20 REM by Mike Cook
   30 REM (c) Micro User 1987
   40 MODE 7
   50 PRINTTAB(0,3);"Beeb Bodybuilding C
ourse"
   60 PRINT"Video Digitiser Driver"
   70 PRINT"By Mike Cook"
   80 PRINTTAB(0,8);"S - To Snap a pictu
re"
   90 PRINT"A - To Analyse the grey scal
e"
  100 PRINT"H - To replot the analysed H
istogram"
  110 PRINT"D - To save image to disc"
  120 PRINT"L - To load image from disc"
  130 PRINT TAB(0,16);"Press any key to
continue"
  140 A$=GET$
  150 DIM EB% 10
  160 ?&72=230 :REM NUMER OF LINES TO SK
IP FROM SYNC
  170 ?&74=60 :REM PICTURE X OFFSET
  180 ?&70=80 :REM NUMBER OF COLOUMS TO
DIGITISE
  190 FOR A=0 TO 2 STEP 2
  200 P%=&900
  210 [
  220 OPT A
  230 .INCREMENT \ MOVE MEMORY POINTER O
N
  240 INC &76 \ TO NEXT SCREEN ROW
  250 BNE SKIP1
  260 INC &77
  270 .SKIP1 \ SEE IF WE NEED TO ADD &27
8
  280 LDA #7
  290 AND &76
  300 BNE SKIP2 \ BRANCH IF WE DONT
  310 CLC
  320 LDA #&78 \ ADD 78 TO LSB
  330 ADC &76
  340 STA &76
  350 LDA #2 \ ADD TO MSB
  360 ADC &77
  370 STA &77
  380 .SKIP2
  390 RTS
  400 .GRAB \ GET A SAMPLE
  410 LDA #8
  420 .NSAMP
  430 BIT &FE6D \ TEST TO SEE IF LATCH I
S FULL
  440 BEQ NSAMP
  450 LDA &FE60 \ GET SAMPLE
  460 AND #&55 \ CLEAR OUT OTHER BITS
  470 RTS
  480 .RCOLOUM \ READ IN A COLOUM (ODD)
  490 LDX #0
  500 .LOOP
  510 JSR GRAB
  520 ASL A
  530 STA (&76),Y
  540 JSR INCREMENT
  550 DEX
  560 BNE LOOP
  570 RTS
  580 .RECOLOUM \ READ IN A COLOUM (EVEN
)
  590 LDX #0
  600 .LOOP2
  610 JSR GRAB
  620 ORA (&76),Y
  630 STA (&76),Y
  640 JSR INCREMENT
  650 DEX
  660 BNE LOOP2
  670 RTS
  680 .I_MEM
  690 LDA #0
  700 STA &76
  710 LDA &73
  720 STA &77
  730 LDA #&28 \ INCREMENT POSITION
  740 STA &FE60
  750 LDA #&08
  760 STA &FE60
  770 .H_FRAME \HOLD UNTIL FRAME PULSE
  780 LDA &FE60
  790 BMI H_FRAME
  800 LDX &72
  810 .H_LINE \ HOLD UNTIL N LINES ARE P
AST
  820 LDA #&10
  830 BIT &FE6E
  840 BEQ H_LINE
  850 LDA &FE6E
  860 STA &FE6E
  870 DEX
  880 BNE H_LINE
  890 RTS
```

involving moving a pixel from one place to another.

Bas-relief is a photographic technique which involves putting a positive and negative of the same subject in an enlarger and slightly offsetting them. The result is like a relief sculpture.

Thresholding is simply reducing a picture to black or white, here it is done by altering the palette. When trying to get a computer to analyse a picture it is often useful to find the edges of objects. There are many ways to do it – this is one of the simpler ones.

● *That about wraps it up from me, for the moment, about images. There is a lot more to say about them but it will have to wait. Meanwhile get your soldering irons hot for next month's project.*

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....
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Rossendale, Lancs.
BB4 4JX.

Overseas orders add £3 if airmail delivery is required.

◀ From Page 99

```
  900 .SET_POINT
  910 LDA #0
  920 STA &FE60 \ RESET POSITION
  930 LDA #&8
  940 STA &FE60 \ ENABLE COUNTER
  950 LDX &74 \ INITIAL SAMPLE POSITION
  960 .I_LINE  \ INCREMENT PRELOAD COUNT
ER
  970 LDA #&28
  980 STA &FE60
  990 LDA #&8
 1000 STA &FE60
 1010 DEX
 1020 BNE I_LINE
 1030 RTS
 1040 .SNAP \ TAKE A DIGITAL PICTURE
 1050 SEI
 1060 LDA #&28
 1070 STA &FE62 \ INITILISE PIA
 1080 LDA #&10 \ ENABLE CB2 +
 1090 STA &FE6C
 1100 LDA #&98 \ BOTH CONTROL LINES
 1110 STA &FE6E \ENABLE INTERRUPT
 1120 LDA #&30 \ MSB OF POINTER
 1130 STA &73
 1140 LDA &70 \ NUMBER OF COLOUMS TO USE
 1150 STA &71
 1160 JSR SET_POINT
 1170 LDY #0
 1180 .NL
 1190 JSR I_MEM
 1200 JSR RCOLOUM
 1210 JSR I_MEM
 1220 JSR RECOLOUM
 1230 INY:INY:INY:INY:INY:INY:INY:INY
 1240 BNE SKIP3
 1250 INC &73
 1260 .SKIP3
 1270 DEC &71
 1280 BNE NL
 1290 LDA #&18 \ DISABLE INTERRUPTS
 1300 STA &FE6E
 1310 LDA &FE6D \ REMOVE ANY INTERRUPT
 1320 STA &FE6D
 1330 CLI
 1340 RTS
 1350 .MCLR \ MEMORY CLEAR
 1360 LDX #&8F \ CLEAR MEMORY
 1370 LDA #0 \ FOR ACCUMULATING THE
 1380 .LOOP4 \ HISTORGRAM
 1390 STA &0,X
 1400 DEX
 1410 CPX #&7A
 1420 BNE LOOP4
 1430 RTS
 1440 .ANALISE \ HISTOGRAM ANALISIS
 1450 JSR MCLR
 1460 LDA #&30
 1470 STA &7C \ START OF SCREEN
 1480 LDY #0
 1490 .LOOP5 \ MAIN LOOP IN HISTOGRAM
 1500 LDA (&7B),Y
 1510 JSR IP
 1520 LDA (&7B),Y
 1530 LSR A
 1540 JSR IP
 1550 JSR MPOINT
 1560 LDA #&80 \ TEST TO SEE IF FINISHED
 1570 CMP &7C
 1580 BNE LOOP5
 1590 RTS
 1600 .MPOINT INC &7B
 1610 BNE SKIP5
 1620 INC &7C
 1630 .SKIP5
 1640 .IP \ INCREMENT PIXEL COUNTER
 1650 AND #&15
 1660 TAX \ PUT PIXEL VALUE IN X
 1670 LDA PL%,X \ GET REAL VALUE
 1680 ASL A \ MULTYPLY BY TWO
 1690 TAX
 1700 INC &80,X \ INCREMENT PIXEL COUNT
 1710 BNE SKIP4
 1720 INC &81,X \ INCREMENT MSB
 1730 .SKIP4
 1740 RTS
 1750 .PL%
 1760 ]
 1770 NEXT
 1780 MODE2
 1790 VDU5
 1800 PROC_GREY
 1810 PROC_PINT
 1820 REPEAT
 1830 A$=GET$
 1840 IF A$="S" THEN CALL MCLR:CALL SNAP
 1850 IF A$="A" THEN PROC_HIST
 1860 IF A$="H" THEN PROC_GRAPH
 1870 IF A$="D" THEN PROC_DSAVE
 1880 IF A$="L" THEN PROC_DLOAD
 1890 UNTIL FALSE
 1900 END
 1910 DEF PROC_HIST
 1920 CALL ANALISE
 1930 PROC_GRAPH
 1940 ENDPROC
 1950 DEF PROC_GRAPH
 1960 PROC_BAR(1,8)
 1970 D$=GET$
 1980 PROC_BAR(2,7)
 1990 ENDPROC
 2000 DEF PROC_BAR(S%,C%)
 2010 GCOL S%,C%
 2020 FOR X%=0 TO 15 STEP 2
 2030 XS%=X%*50+250
 2040 YS%=(?(&80+X%)+?(&81+X%)*256) DIV
16
 2050 MOVE XS%,0
 2060 MOVE XS%,YS%
 2070 PLOT 85,XS%+30,0
 2080 PLOT 85,XS%+30,YS%
 2090 NEXT
 2100 ENDPROC
 2110 DEF PROC_GREY
 2120 RESTORE 2170
 2130 FOR A%=0 TO 15
 2140 READ C%
 2150 VDU19,A%,C%;0;
 2160 NEXT
 2170 DATA 0,4,1,5,2,6,3,7
 2180 DATA 7,7,7,7,0,0,0,0
 2190 ENDPROC
 2200 DEF PROC_DLOAD
 2210 VDU4
 2220 INPUT "NAME",N$
 2230 VDU5
 2240 C$="LOAD "+N$
 2250 $EB%=C$
 2260 PROC_CLI
 2270 ENDPROC
```

Turn to Page 103 ▶

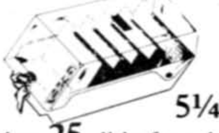
Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 1092 2
  50 = 76A4 B
  60 = 2C3F A
  70 = FC23 1
  80 = D091 5
  90 = FC49 A
 100 = 76DA 6
 110 = FFE4 8
 120 = 61F0 2
 130 = F460 C
 140 = 77F2 D
 150 = B7C2 A
 160 = 7439 0
 170 = 8CAF 0
 180 = 2854 E
 190 = FCB5 8
 200 = C92F B
 210 = EB9E F
 220 = DDA7 6
 230 = 1D04 2
 240 = 374A 4
 250 = 40AE 0
 260 = 3AB7 F
 270 = CE7E A
 280 = 7272 F
 290 = EB6F B
 300 = 97F5 9
 310 = 74FB 9
 320 = 5D2B B
 330 = 3F39 8
 340 = 36A6 C
 350 = F742 5
 360 = 2F18 E
 370 = 2687 2
 380 = A55A 4
 390 = 9843 2
 400 = 3E15 0
 410 = 839D 4
 420 = 8E74 1
 430 = BFD8 8
 440 = 7BF1 C
 450 = 6988 8
 460 = 9817 9
 470 = 9843 A
 480 = F0C9 E
 490 = EA45 C
 500 = 9029 7
 510 = FFBD 2
 520 = 6311 7
 530 = 58C1 9
 540 = 1021 5
 550 = E8A9 E
 560 = E082 D
 570 = 9843 2
 580 = 1457 7
 590 = EA45 8
 600 = BCA8 0
 610 = FFBD C
 620 = 336B D
 630 = 58C1 0
 640 = 1021 C
 650 = E8A9 8
 660 = 693F 4
 670 = 9843 4
 680 = 99C6 3
 690 =  295 0
 700 = 36A6 B
 710 = C115 8
 720 = 2687 1
 730 = B6DB C
 740 = 56E6 F
 750 = F673 4
 760 = 56E6 1
 770 = 7B30 0
 780 = A0F8 A
 790 =  E2E 6
 800 = 7D12 1
 810 = C9F0 0
 820 = 444A A
 830 = E505 8
 840 = E56D A
 850 = 8ECA E
 860 = 78D4 7
 870 = E8A9 9
 880 = D30F 0
 890 = 9843 4
 900 = 19FC 3
 910 =  295 B
 920 = F851 7
 930 = ABCC 0
 940 = F851 A
 950 = 33FE 5
 960 = DBD4 3
 970 = 9011 3
 980 = 56E6 1
 990 = ABCC 1
1000 = 56E6 D
1010 = E8A9 4
1020 = 96AF 2
1030 = 9843 3
1040 = 82CD 9
1050 = 2C4A 3
1060 = 9011 F
1070 = 9E33 1
1080 = 6622 7
1090 = 1812 8
1100 = 462A 8
1110 =  FFD 8
1120 =  842 8
1130 = 6603 7
1140 = AD5C C
1150 = 4641 9
1160 = A590 3
1170 = 9CF1 C
1180 = 3A4C 1
1190 = 2041 5
1200 = 8287 2
1210 = 2041 2
1220 = 7E13 E
1230 =  C6A 5
1240 = 60EC 3
1250 = 7A33 D
1260 = B57B 9
1270 = 73D9 C
1280 = CC04 5
1290 = EF8B B
```

```
1300 = 78D4 4
1310 = AD15 B
1320 = 68F5 0
1330 = D5B1 5
1340 = 9843 F
1350 = 548A 0
1360 = 46FB E
1370 = 9120 2
1380 = 4093 D
1390 = 4240 D
1400 = E8A9 2
1410 = FD43 B
1420 =  9F9 6
1430 = 9843 9
1440 = 7331 E
1450 = 8728 0
1460 = 2228 A
1470 = 235B 4
1480 = 9CF1 C
1490 = 73A2 C
1500 = 9ADD D
1510 = E4C6 F
1520 = 9ADD F
1530 = 1A09 3
1540 = E4C6 3
1550 = D111 E
1560 = F8B3 5
1570 = D382 7
1580 = 19D8 F
1590 = 9843 8
1600 = 2234 F
1610 =   2A F
1620 =  4A4 2
1630 = D5BD 5
1640 = 3CF5 C
1650 = 1432 3
1660 = 3623 5
1670 = B8A8 C
1680 = 69A7 8
1690 = 670E 7
1700 = E1F9 2
1710 = 100B 4
1720 = 974D D
1730 = C59C A
1740 = 9843 A
1750 = F7BC E
1760 = 8B58 0
1770 = 2C83 4
1780 = DA59 1
1790 = 667A E
1800 = 5CCD 6
1810 = A882 5
1820 = BFBA 4
1830 = 77F2 8
1840 = 91EF 4
1850 = 61C7 1
1860 = EB10 7
1870 = 1E01 B
1880 = 5B24 F
1890 = 226C 1
1900 = FD2E E
1910 = 4DBE 9
1920 = 476D 9
1930 = F9ED 6
1940 = ED0F A
1950 = 6F23 C
1960 =  C77 F
1970 = CBB7 8
1980 = 8795 F
1990 = ED0F F
2000 =  C6C 1
2010 = 23DA D
2020 = 5FDC 0
2030 =  B17 E
2040 = 1FFC 7
2050 = 9E96 D
2060 = F24A 7
2070 = E863 5
2080 = EF0F 0
2090 = 2C83 5
2100 = ED0F 4
2110 = 52BA 7
2120 = 5AC4 E
2130 = 97E7 3
2140 = AE0F 1
2150 = EC24 D
2160 = 2C83 7
2170 = 3D87 4
2180 = 39F7 1
2190 = ED0F 4
2200 = D2C3 D
2210 = 765B 4
2220 = E599 A
2230 = 667A C
2240 = E726 1
2250 = E34C 2
2260 =  FB1 9
2270 = ED0F 8
2280 = 8C4E B
2290 = 2D2B 1
2300 = C782 E
2310 = 9D46 1
2320 = CDCA 6
2330 = 2D2B 3
2340 = 6F3D 0
2350 = 2F83 D
2360 = BE85 A
2370 = E34C 3
2380 =  FB1 7
2390 = ED0F 1
2400 = 91DD 8
2410 = 782A B
2420 = 3FDC 3
2430 = 17A4 8
2440 = ED0F 7
2450 = A6F5 1
2460 =    0 1
2470 = 894E D
2480 = 28AF 2
2490 = E66D 3
2500 = 2C83 4
2510 = 3955 B
2520 = 952D 0
2530 = ABAB 2
2540 = 2C83 D
2550 = A9E5 E
2560 = ED0F E
```

FREE

STAR OFFER



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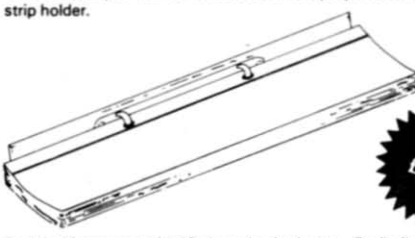

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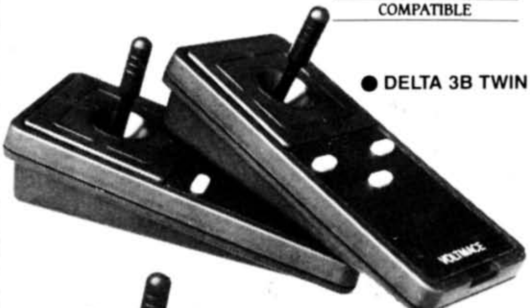

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DELTA 14B £14.95
Our original ACORN/BBC handset. The same super light joystick, but with 14 long life buttons, video game tested for many years. A DELTA14B/1 is needed to run the keypad but a 14B on it's own will work as a joystick and fire buttons, so you can always add the 14B/1 to it later.

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N.B. On a Master a small extension lead is needed to clear the RGB socket (£5.95 extra).
Full instructions are provided to include the keypad in your own programs even in BASIC or for the non-programmer a DELTA DRIVER cassette is available with keyboard to joystick/keypad conversions and keypad set up programs.

FOR THE MASTER COMPACT OR ELECTRON FITTED WITH A SWITCHED JOYSTICK INTERFACE
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For an ELECTRON with a switched joystick interface (not a PLUS 1) this gives you the same delightful light, fast action of the DELTA joysticks but fitted with a 9 way D plug as per Atari, Commodore, etc. and will run on First Byte interface or similar.

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Access

Available from your dealer or direct from us on (0462) 894410

VISA

Unit 9, Bondor Business Centre, London Road, Baldock, Herts. SG7 6NG. Telephone (0462) 894410

◀ From Page 100

```
 2280 DEF PROC_DSAVE
 2290 MOVE 0,128
 2300 GCOL 1,8
 2310 PRINT "NAME";
 2320 INPUT N$
 2330 MOVE 0,128
 2340 GCOL 2,7
 2350 PRINT "NAME?";N$
 2360 C$="SAVE "+N$+" 3000 8000"
 2370 $EB%=C$
 2380 PROC_CLI
 2390 ENDPROC
 2400 DEF PROC_CLI
 2410 X%=EB% MOD 256
 2420 Y%=EB% DIV 256
 2430 CALL &FFF7
 2440 ENDPROC
 2450 DEF PROC_PINT
 2460 REM INITILISE PIXEL LOOK UP TABLE
 2470 RESTORE 2550
 2480 FOR A=0 TO 32
 2490 ?(PL%+A)=0
 2500 NEXT
 2510 FOR A=0 TO 7
 2520 READ B%,P%
 2530 ?(PL%+B%)=P%
 2540 NEXT
 2550 DATA 0,0,1,1,4,2,5,3,16,4,17,5,20,
6,21,7
 2560 ENDPROC
```

Listing III

```
   10 REM Video Processing
   20 REM by Mike Cook
   30 REM (c) Micro User 1987
   40 MODE 7
   50 PRINTTAB(0,3);"Beeb Bodybuilding C
ourse"
   60 PRINT"Video Processing"
   70 PRINT"By Mike Cook"
   80 PRINTTAB(0,8);"E - Edge detection"
   90 PRINT"T - Threshold"
  100 PRINT"Q - Reflect Quadrant"
  110 PRINT"B - Basrelief"
  120 PRINT"G - Restores Grey scale afte
r threshold"
  130 PRINT"S - Successive threshold sli
ces"
  140 PRINT"D - To save image to disc"
  150 PRINT"L - To load image from disc"
  160 PRINT TAB(0,16);"Press any key to
continue"
  170 A$=GET$
  180 DIM L%(160),EB% 10
  190 MODE2
  200 VDU5
  210 PROC_GREY
  220 REPEAT
  230 IF A$="E" THEN PROC_EDGE
  240 IF A$="T" THEN PROC_THRESH
  250 IF A$="G" THEN PROC_GREY
  260 IF A$="B" THEN PROC_BASREL
  270 IF A$="R" THEN PROC_REFLECT
  280 IF A$="S" THEN PROC_SLICE
  290 IF A$="D" THEN PROC_DSAVE
  300 IF A$="L" THEN PROC_DLOAD
  310 A$=GET$
  320 UNTIL FALSE
  330 END
  340 DEF PROC_GREY
  350 RESTORE 400
  360 FOR A%=0 TO 15
  370 READ C%
  380 VDU19,A%,C%;0;
  390 NEXT
  400 DATA 0,4,1,5,2,6,3,7
  410 DATA 7,7,7,7,0,0,0,0
  420 ENDPROC
  430 DEF PROC_DLOAD
  440 VDU4
  450 INPUT "NAME",N$
  460 VDU5
  470 C$="LOAD "+N$
  480 $EB%=C$
  490 PROC_CLI
  500 ENDPROC
  510 DEF PROC_DSAVE
  520 MOVE 0,128
  530 GCOL 1,8
  540 PRINT "NAME";
  550 INPUT N$
  560 MOVE 0,128
  570 GCOL 2,7
  580 PRINT "NAME?";N$
  590 C$="SAVE "+N$+" 3000 8000"
  600 $EB%=C$
  610 PROC_CLI
  620 ENDPROC
  630 DEF PROC_CLI
  640 X%=EB% MOD 256
  650 Y%=EB% DIV 256
  660 CALL &FFF7
  670 ENDPROC
  680 DEF PROC_THRESH
  690 MOVE 0,128
  700 GCOL 1,8
  710 PRINT"THRESHOLD VALUE ?";
  720 A$=GET$
  730 GCOL 2,7
  740 MOVE 0,128
  750 PRINT"THRESHOLD VALUE ?";A$
  760 PROC_THR((ASC(A$) AND 7))
  770 ENDPROC
  780 DEF PROC_THR(T%)
  790 FOR A%=0 TO 7
  800 IF A%>T% THEN V%=7 ELSE V%=0
  810 VDU19,A%,V%;0;
  820 NEXT
  830 FOR A%=8 TO 15
  840 VDU19,A%,4;0;
  850 NEXT
  860 ENDPROC
  870 DEF PROC_SLICE
  880 MOVE 0,128
  890 GCOL 1,8
  900 PRINT"PRESS FOR NEXT SLICE"
  910 A$=GET$
  920 MOVE 0,128
  930 GCOL 2,7
  940 PRINT"PRESS FOR NEXT SLICE"
  950 FOR D%=1 TO 6
  960 PROC_THR(D%)
  970 A$=GET$
  980 NEXT
  990 PROC_GREY
 1000 ENDPROC
 1010 DEF PROC_EDGE
 1020 FOR Y%=1023 TO 0 STEP -4
 1030 FOR X%=0 TO 1280 STEP 8
 1040 T%=ABS(2*POINT(X%,Y%)-POINT(X%+8,Y
%)-POINT(X%,Y%-4))
 1050 IF T%>7 THEN T%=7
 1060 GCOL 0,T%
 1070 PLOT 69,X%,Y%
 1080 NEXT
 1090 NEXT
 1100 ENDPROC
 1110 DEF PROC_REFLECT
 1120 FOR Y%=1023 TO 511 STEP -4
 1130 FOR X%=0 TO 640 STEP 8
 1140 T%=POINT(X%,Y%)
 1150 GCOL 0,T%
 1160 PLOT 69,1279-X%,Y%
 1170 PLOT 69,X%,1023-Y%
 1180 PLOT 69,1279-X%,1023-Y%
 1190 NEXT
 1200 NEXT
 1210 ENDPROC
 1220 DEF PROC_RLINE(S%)
 1230 FOR A%=0 TO 159
 1240 L%(A%)=POINT(A%*8,S%)
 1250 NEXT
 1260 ENDPROC
 1270 DEF PROC_BASREL
 1280 FOR Y%=1023 TO 0 STEP -4
 1290 PROC_RLINE(Y%-4)
 1300 FOR X%=8 TO 1280 STEP 8
 1310 T%=3+(POINT(X%,Y%)-L%((X%-8)DIV 8)

 1320 IF T%>7 THEN T%=7
 1330 IF T%<0 THEN T%=0
 1340 GCOL 0,T%
 1350 PLOT 69,X%,Y%
 1360 NEXT
 1370 NEXT
 1380 ENDPROC
```

Get it right!

```
  10 =    0 0 | 470 = E726 7 |  930 = 6F3D 2
  20 =    0 0 | 480 = E34C B |  940 = 761F D
  30 =    0 0 | 490 =  FB1 3 |  950 = A0EF 7
  40 = 1092 2 | 500 = ED0F 3 |  960 = E2A2 E
  50 = 76A4 B | 510 = 8C4E 2 |  970 = 77F2 F
  60 = 50C4 5 | 520 = 2D2B 7 |  980 = 2C83 8
  70 = FC23 8 | 530 = C782 1 |  990 = 5CCD 2
  80 = 392F A | 540 = 9D46 1 | 1000 = ED0F F
  90 = 2AF9 3 | 550 = CDCA 5 | 1010 = FBCE 9
 100 = 9EA7 9 | 560 = 2D2B E | 1020 = AA6B D
 110 = 6A79 2 | 570 = 6F3D 2 | 1030 = BE62 4
 120 = 2165 C | 580 = 2F83 3 | 1040 = 2953 D
 130 =  A20 E | 590 = BE85 0 | 1050 = 85D3 D
 140 = FFE4 E | 600 = E34C 6 | 1060 = 679F 3
 150 = 61F0 2 | 610 =  FB1 C | 1070 = B9A7 7
 160 = F460 6 | 620 = ED0F 7 | 1080 = 2C83 E
 170 = 77F2 5 | 630 = 91DD D | 1090 = 2C83 5
 180 = ACB2 D | 640 = 782A A | 1100 = ED0F 0
 190 = DA59 5 | 650 = 3FDC 7 | 1110 = A0F2 8
 200 = 667A 9 | 660 = 17A4 F | 1120 = 946F 3
 210 = 5CCD 0 | 670 = ED0F 9 | 1130 = 8666 7
 220 = BFBA 4 | 680 = 1674 1 | 1140 = DB0B 3
 230 = 86F0 6 | 690 = 2D2B 8 | 1150 = 679F 7
 240 = EC3B 7 | 700 = C782 9 | 1160 = 4B45 A
 250 = 8F37 2 | 710 = FDB7 A | 1170 = BF04 4
 260 = 13EB 1 | 720 = 77F2 E | 1180 = AD53 A
 270 = AAC0 0 | 730 = 6F3D B | 1190 = 2C83 4
 280 = D8FA F | 740 = 2D2B C | 1200 = 2C83 1
 290 = 1E01 2 | 750 = E8BA 0 | 1210 = ED0F C
 300 = 5B24 B | 760 = 786B C | 1220 =  486 0
 310 = 77F2 3 | 770 = ED0F 3 | 1230 = B324 C
 320 = 226C E | 780 = 2B0E B | 1240 = 2ABF F
 330 = FD2E 5 | 790 = 5221 6 | 1250 = 2C83 C
 340 = 52BA 1 | 800 = 26B2 2 | 1260 = ED0F 3
 350 = E765 9 | 810 = CB29 3 | 1270 = 707B 8
 360 = 97E7 8 | 820 = 2C83 A | 1280 = AA6B 2
 370 = AE0F 6 | 830 = 9AA5 B | 1290 = 64AB 2
 380 = EC24 3 | 840 = B313 9 | 1300 = A5CA 1
 390 = 2C83 0 | 850 = 2C83 A | 1310 = 73D7 A
 400 = 3D87 3 | 860 = ED0F F | 1320 = 85D3 E
 410 = 39F7 E | 870 = 75AE 3 | 1330 = F44B 6
 420 = ED0F C | 880 = 2D2B E | 1340 = 679F 7
 430 = D2C3 9 | 890 = C782 7 | 1350 = B9A7 C
 440 = 765B 9 | 900 = 761F 8 | 1360 = 2C83 B
 450 = E599 6 | 910 = 77F2 8 | 1370 = 2C83 3
 460 = 667A C | 920 = 2D2B 9 | 1380 = ED0F A
```

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Peter Davidson proves how easy it is to download software

Telesoftware techniques

THERE are many sources of telesoftware. Last month we looked at downloading a program from MicroLink to illustrate the techniques to use for obtaining software from text-based communication systems. This month we'll move on to telesoftware from viewdata systems, and also have a look at how easily you can download software from Ceefax.

A lot of viewdata systems such as bulletin boards carry software, but to show how simple it is to get it we'll find the appropriate section on Prestel and download a program.

Although I'm using Commstar the procedure is very similar with most communication packages. There are plenty of Help frames on Prestel if you have problems with your particular software.

The first step in downloading telesoftware is to log on to the system and find the software section. Log on to Prestel in the usual way, and once the Prestel introduction appears type *1 to move to the Main Index that you can see in Figure I.

To help us to push forward the frontiers of knowledge, let's download an educational program. From the main index move to the educational section by keying 23 and you will see the screen shown in Figure II.

Keying 1 at this screen followed by 14 at the next takes you to the School's Telesoftware page shown in Figure III. You can go to this page directly anytime you want by keying *880 now you know the page number.

It's then just a matter of choosing the program you want. As you browse round screens like Figure VI you'll notice that some programs are free and some are charged. With the latter you can look at frames up to the actual program without incurring cost, so it is possible to look at the introduction to see if it is exactly the one that you want.

When you make your selection you'll be given a few screens of information about the program, as in Figure V. Pressing Return will keep moving you to the next page until you reach the page before the program itself – Figure VI.

At this point you are ready to download the program. Remember that if it is one that is charged, you will have incurred no costs up to this point.

The way you download the software varies depending on the communications package you are using, but in most cases it's just a matter of pressing f5.

If you are using a disc buffer you'll be prompted for the filename and the program will then download straight to disc, but if you are using memory as a buffer you must remember to clear the buffer before the operation and save it afterwards.

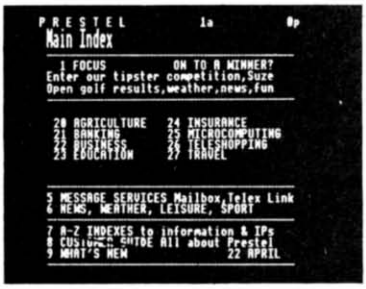
You've now finished the downloading part, so you can log off the system and you have a program on your disc ready to use. Any special instructions will have been contained in the introduction screens, but with the one I chose (Skittles) the program saved in a form ready to be CHAINed.

With some other programs you may have to CALL a value given in the introduction screens. Also you'll find that some of the software you download is not in the form you need to be able to use it. When you run the downloaded program the code you need will be created on your disc.

Well, that's all there is to downloading software from viewdata systems such as Prestel. As you can see, it's very easy and there are plenty of Help screens if you have problems. The best way to learn is by practice, so start downloading and you'll soon have a wealth of new software.

Another source of telesoftware is from Ceefax. Of course you'll need a teletext adapter, but if you have one you'll find the programs, including some from *The Micro User*, well worth downloading. In

Turn to Page 106 ▶



```
PRESTEL                1a           0p
Main Index
 1 FOCUS            ON TO A WINNER?
Enter our tipster competition,Suze
Open golf results,weather,news,fun

  20 AGRICULTURE   24 INSURANCE
  21 BANKING       25 MICROCOMPUTING
  22 BUSINESS      26 TELESHOPPING
  23 EDUCATION     27 TRAVEL

5 MESSAGE SERVICES Mailbox,Telex Link
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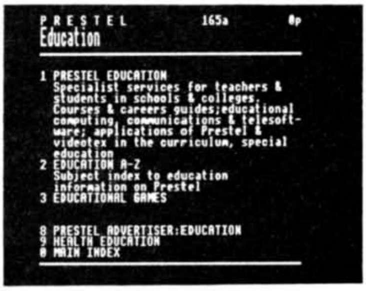
8 CUSTOMER GUIDE All about Prestel
9 WHAT'S NEW               22 APRIL
```

Figure I



```
PRESTEL                165a         0p
Education

1 PRESTEL EDUCATION
  Specialist services for teachers &
  students in schools & colleges.
  Courses & careers guides;educational
  computing, communications & telesoft-
  ware; applications of Prestel &
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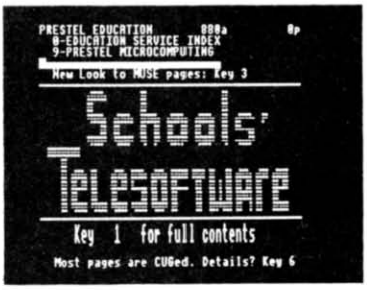
  education
2 EDUCATION A-Z
  Subject index to education
  information on Prestel
3 EDUCATIONAL GAMES

8 PRESTEL ADVERTISER:EDUCATION
9 HEALTH EDUCATION
0 MAIN INDEX
```

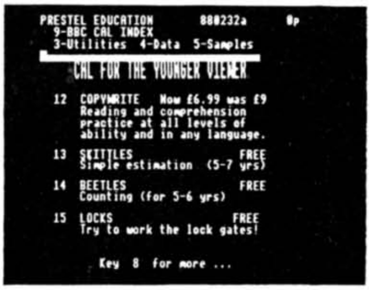
Figure II



```
PRESTEL EDUCATION      880a         0p
  0-EDUCATION SERVICE INDEX
  9-PRESTEL MICROCOMPUTING

  New Look to MUSE pages: Key 3
          Schools'
       Telesoftware
    Key  1  for full contents
  Most pages are CUGed. Details? Key 6
```

Figure III



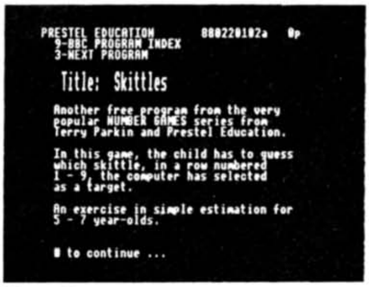
```
PRESTEL EDUCATION      880232a      0p
  9-BBC CAL INDEX
  3-Utilities  4-Data  5-Samples

    CAL FOR THE YOUNGER VIEWER

  12  COPYWRITE   Now £6.99 was £9
      Reading and comprehension
      practice at all levels of
      ability and in any language.
  13  SKITTLES                 FREE
      Simple estimation  (5-7 yrs)
  14  BEETLES                  FREE
      Counting (for 5-6 yrs)
  15  LOCKS                    FREE
      Try to work the lock gates!

         Key  8  for more ...
```

Figure IV



```
PRESTEL EDUCATION      880220102a   0p
  9-BBC PROGRAM INDEX
  3-NEXT PROGRAM

  Title:  Skittles

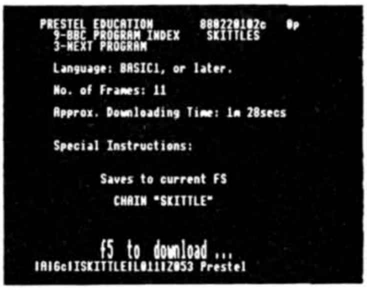
  Another free program from the very
  popular NUMBER GAMES series from
  Terry Parkin and Prestel Education.

  In this game, the child has to guess
  which skittle, in a row numbered
  1 - 9, the computer has selected
  as a target.

  An exercise in simple estimation for
  5 - 7 year-olds.

  ■ to continue ...
```

Figure V



```
PRESTEL EDUCATION      880220102c   0p
  9-BBC PROGRAM INDEX    SKITTLES
  3-NEXT PROGRAM

  Language: BASIC1, or later.

  No. of Frames: 11

  Approx. Downloading Time: 1m 28secs

  Special Instructions:

          Saves to current FS

           CHAIN "SKITTLE"

          f5 to download ...
|A|Gc|SKITTLE|L011|Z053 Prestel
```

Figure VI

◄ *From Page 105*

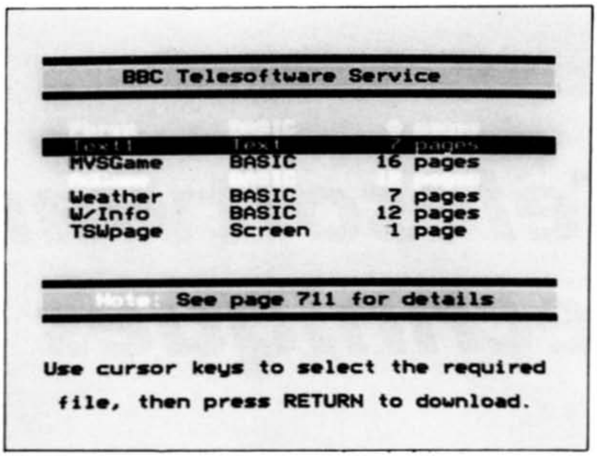
fact the adapter could pay for itself in quite a short time.

Downloading software with the old TFS rom is quite tricky, so as the replacement ATS rom is so cheap, I'm only going to use that and suggest that if you have an old TFS rom you upgrade. After all, the new rom is only the same cost as some of the software it will give you access to.

The telesoftware section of Ceefax is on BBC2, so select this by pressing Shift+f2, then press f5 to download the software. This causes the catalogue to be loaded, and during the short pause while it is loaded you will see the messages *Finding catalogue*, followed by *Loading catalogue*.

Once the catalogue has loaded you will be presented with a menu on the screen shown in Figure VII. Select the program you want by moving the cursor up and down and press Return to confirm your choice. You'll then see a filename with some addresses to confirm your selection.

After a short pause a row of blocks will appear indicating how many pages the program takes. These are highlighted one by one as the program downloads to disc until they are all highlighted and you are returned to the telesoftware menu ready to make your next selection.



```
BBC Telesoftware Service

Text1        Text           7 pages
MVSGame      BASIC         16 pages

Weather      BASIC          7 pages
W/Info       BASIC         12 pages
TSWpage      Screen         1 page

        See page 711 for details

Use cursor keys to select the required
  file, then press RETURN to download.
```

Figure VII

It's all very easy, but there are a couple of points you need to know. Firstly, don't worry if you get a *Wrong filename* error message after you select the program to download. This just means that more than one program are on one page of a carousel and yours hasn't been reached yet.

Secondly, most files are disordered, meaning that the pages can be picked up in any order. So downloading needn't start at the beginning of a program, and if an error occurs the rest of the program can be downloaded and and missing bits obtained on the next or subsequent cycles.

Occasionally programs are transmitted in an ordered way, meaning that you have to wait for the start before downloading starts and after any errors downloading stops until the same section comes round again. The only difference that you'll notice if you find an ordered one is that it may take longer to download.

● *That's it for now. Next month I'll be looking at some of the communications packages available and how easy they will perform those everyday online tasks.*

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VDU Anti-static Glass Screen Cleaner	£4.99	
Key Board & Plastics Cleaner	£5.50	
Complete 5.25" Computer Cleaning Kit inc. 5.25" head cleaner, VDU & Keyboard cleaners, Puffer Brush & Cloths	£13.80	

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120cps Normal
25cps NLQ

1K I/P Buffer 8bit Parallel FX80 compatible inc. Graphics, Variable printing & line pitches, Paper feed by Pin & Friction **Fonts:** Pica, Elite, Italics, Condensed, Enlarged, Subscripted, Superscripted etc.
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Dealer enquiries invited.

Scandinavian countries please contact our agent for prices
Magnum Data, PO Box 627, N-5001 Bergen, Norway.

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE
17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

BBC MASTER SERIES

AMB15 MASTER (see page 6 for details of bundled software included in the price)	£395 (a)
AMB12 MASTER ET	£315 (a)
AMCO6 Turbo 65C02 Module	£99 (b)
ADC08 512 Processor	£195 (b)

ADF14 ROM Cartridge	£13(d)	ADJ23 Ref Manual Part II	£14(c)
ADF10 Econet Module	£41(c)	ADJ24 Adv Ref Manual	£19.50(c)
ADJ22 Ref Manual Part I	£14(c)	View User Guide	£10(d)
BBC Master Dust Cover	£4.75(d)	Viewsheet User Guide	£10(d)

MASTER ROM/RAM CARTRIDGES

TRC1 Two rom cartridge	£8.95 (d)
TRC4 Four rom cartridge	£11.95 (d)
TRC 32K Cartridge inc RAM	£29.95 (d)

BBC MASTER COMPACT

See page 6 for free bundled software

SYSTEM 1 128K, Single 640K Drive & bundled software.	£385 (a)
SYSTEM 2 System 1 with a 12" Hi Res Monochrome Monitor.	£469 (a)
SYSTEM 3 System 1 with a 14" Med Res RGB Monitor.	£599 (a)
Second Drive Kit.	£99 (c)
Serial Kit.	£29 (d)
T.V. Modulator	£29 (d)
Extension cable for external 5.25" 80T Drive (Serial Kit).	£12.50 (d)

UPGRADE KITS

1.2 OS ROM	£15 (d)	ADFS ROM	£26 (d)
DNFS ROM	£17.50 (d)	1770 DFS Kit	£43.50 (d)
BASIC II ROM	£22.50 (d)	Econet Kit	£55 (d)

ECONET ACCESSORIES

Econet Starter Kit	£85 (b)	Econet Bridge	£174 (b)
Econet Socket Set	£29 (c)	Printer Server Rom	£41 (d)
File Server Level II	£75 (b)	10 Station Lead Set	£26 (d)
Master FS Utility Disc	£17.25 (d)		

ACW/CO-PROCESSOR

For full specification see page 5

32016 Co-processor	£999 (a)
Cambridge Workstation	£3450 (a)
X25 Gateway	£2175 (b)
PANOS/PANDORA Upgrade incl 32000 BASIC FP.	£29 (d)
Co-Processor upgrade to 10 MHz operation for faster processing.	£POA (d)
Time Warp Real Time Clock with utilities for reading time and date in PANOS (for model B and B+ users).	£39 (c)
32016 Instruction Set Manual.	£25 (c)

WINCHESTER DRIVES

P20HD TECHNOMATIC 20 Mbyte Winchester Drive including Acorn ADFS ROM	£599 (a)
P10HD TECHNOMATIC 10 Mbyte Winchester Drive. Fully compatible with Acorn ADFS **Special offer**	£399 (a)
P204HP TECHNOMATIC 20 Mbyte Winchester and a 80T DS floppy Drive built in a monitor stand. Includes ADFS Rom.	£849 (a)
P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. Includes ADFS Rom.	£1,499 (a)
TS10 10 Mbyte Tape Streamer Backup unit with utilities.	£695 (a)
TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10.	£19 (d)
Enquire for larger capacity Winchesters. These Winchesters are compatible with the S.J. File Server. Special adaptor for S.J. File Server	£28 (d)

WINCHESTER
Drive Multiplexer

TWM2 for two computers.	£99 (b)
TWM4 for four Computers.	£159 (b)

Details on Technomatic Winchesters on page 6

SECOND PROCESSORS

Universal 2nd Processor Adaptor	£75 (b)
TORCH ZEP100	£229 (a)
MULTIFORM Z80 TECHNOMATICs multi format Z80 system includes a FREE Pocket Wordstar + MS/DOS Read/Write Utility	£289 (b)

ACORN IEEE INTERFACE

Allows BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard. The interface can link upto 14 compatible devices. Typical applications are in experimental work in academic and industrial labs.	£265 (a)

TELETEXT ADAPTOR

Converts your computer into a teletext receiver.	£95 (b)
BBC Publications rom for enhanced Teletext Utilities.	£7.95 (d)

PRINTERS

EPSON LX86 120 cps, variety of fonts, including NLQ, bit image graphics, IBM char/graphics compatible, centronics interface standard.	£199 (a)
EPSON FX800 An enhanced version of FX85. Call for details.	£329 (a)
EPSON FX1000 An enhanced version of FX105. Call for details.	£449 (a)
EPSON EX800 See details on page 5.	£409 (a)
Colour option for EX800/EX1000.	£59 (b)
EPSON LQ800 See details on page 5.	£439 (a)
EPSON LQ1000 As LQ800 but wider carriage for 136 columns.	£589 (a)
TAXAN KP815 Enhanced KP810 with 160cps and full IBM compatibility.	£269 (a)
TAXAN KP915 Enhanced KP910 with 180cps and full IBM compatibility.	£369 (a)
NATIONAL PANASONIC KX P1081	£169 (a)
STAR NL 10 (Parallel Interface)	£209 (a)
STAR NL 10 (Serial Interface)	£279 (a)
INTEGREX Multicolour Inkjet printer. Ideally suited for high res colour VDU screen dumps. Quiteness & consistent output are major characteristics.	£549 (a)
	£525 (a)
BBC Screen dump for Integrex.	£15 (d)
BROTHER HR20 A new attractively styled printer from Brother with unusually quiet operation, host of new fatures, including option to copy current documents. 8K buffer standard expandable to 16K. Parallel & Serial ports as standard.	£349 (a)
NAT PANASONIC KX P3131 Daisy wheel printer with 37K buffer, 17 cps, bi-directional, parallel interface	£249 (a)
JUKI 6100 Daisy wheel printer 15 cps, 2K buffer, switchable 10/12/15 cpi proportional spacing, underlining. Parallel interface.	£319 (a)

PLOTTERS

HITACHI 672	£479 (a)
GRAPHICS WORKSTATION	£599 (a)

LINEAR GRAPHICS
Full range of accessories available for plotmate plotters

A4S PLOTMATE	£370 (a)
A4SM PLOTMATE	£450 (a)
A3M PLOTMATE	£569 (a)

(Enquire re educational prices for the Linear Graphics plotters)

Parallel Printer Lead (1.2m).	£6 (d)
Serial Printer Lead (1.2m).	£7 (d)

PRINTER SHARERS & BUFFERS

BUFFALO PB Buffer
Parallel buffer for internal fitting to most Epson printers. Simple to instal.

PB128 (128K)	£99 (c)

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High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases, all lines fully switched.

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3 Computers to 1 Printer 36v36-3	£69(c)	25v25-3	£65(c)
4 Computers to 1 Printer 36v36-4	£85(c)	25v25-4	£75(c)
2 Computers 2 Printers X-over 36v36-x	£69(c)	25v25-x	£65(c)
BBC Cable set 3 to 1 (1m ea)	£32(d)		£34(c)
BBC Cable set 4 to 1 (1m ea)	£39(d)		£41(c)

BBC Computer Sharer: TCS26 1 computer to 2 printers fitted with BBC cable	£22 (c)

Paper & Labels
Plain fanfold paper with microperforation:

2000 sheets 9½ × 11"	£12 (£3.50)
2000 sheets 14½ × 11"	£18.50 (£4.50)
1000 sheets A4	£12.50 (£3.50)

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(b) £2.50
(c) £1.50
(d) £1.00

DISC DRIVES

All floppy drives carry a two year warranty

5.25" Single Drives 40/80 switchable: **TS400** 400K/640K	£114 (b)
PS400 400K/640K with integral mains power supply	£129 (b)
5.25" Dual Drives 40/80 switchable: **TD800** 800K/128OK	£199 (a)
PD800 800K/1280K with integral mains power supply	£229 (a)
PD800P 800K/1280K with integral mainspower supply and monitor stand	£249 (a)
3.5" 80T DS Drives: **TS351** single 400K/640K	£75 (b)
PS351 single 400K/640K with integral mains power supply	£119 (b)
TD352 Dual 800K/1280K	£135 (b)
PD352 Dual 800K/1280K with integral mains power supply	£187 (b)
PD853 Combo Dual 5.25"/3.5" drive with psu.	£229 (a)

DISC DRIVE MULTIPLEXER

TDM2 Dual Unit: 2 computers/one drive unit	£75 (b)
TDM4 Quad Unit: 4 computers/one drive unit	£135 (b)

3M FLOPPY DISCS

5.25" Discs in packs of 10

744 40T SS DD	£10.00 (d)
745 40T DS DD	£12.00 (d)
746 80T SS DD	£14.50 (d)
747 80T DS DD	£15.50 (d)

(Add £1 for library case packing)

3.5" Discs in packs of 10

80T SS DD	£20 (d)
80T DS DD	£25 (d)

BULK DISCS

High quality unlabelled discs supplied in packs of 50 in a storage box. The 5.25" discs have the reinforcing hub rings. These discs are guaranteed for life.

50 5.25" 40 T single sided discs in lockable box.	£35 (b)
50 5.25" 80T double sided discs in lockable box.	£45 (b)
50 3.5" 80T double sided discs in lockable box.	£95 (b)

FLOPPICLENE DRIVE HEAD CLEANING KIT

5.25" Kit with 20 disposable discs	£12.50 (d)
3.5" Kit with 20 disposable discs	£14.00 (d)

DISC STORAGE BOXES

DB340 Lockable 40 x 3.5"	£8.50 (c)
DB550 Lockable 50 x 5.25"	£9.00 (c)
DB570 Lockable 70 x 5.25"	£11.00 (c)
DB5100 Lockable 100 x 5.25"	£13.00 (c)

MONITORS

BBC lead incl with all monitors

MICROVITEC 14" RGB Monitors
Please specify plastic or metal case.

Microvitec 1431 Standard Resolution 453 pixels	£179 (a)
Microvitec 1431AP As 1431 + composite video and sound input	£199 (a)
Microvitec 1451 Medium Resolution 653 pixels	£225 (a)
Microvitec 1451AP As 1451 + composite video and sound input	£259 (a)
Microvitec 1441 High Resolution 895 pixels	£365 (a)

Microvitec 20" RGB/PAL/ Audio Monitors

Microvitec 2030CS Standard Resolution RGB/Comp Video	£380 (a)
Microvitec 2040CS High Resolution RGB/Comp Video	£685 (a)
TOUCHTEC-501 Brings genuine touch screen operation on metal cased Microvitec monitors, incl utilities disc with starter and development programs	£239 (b)
TAXAN SUPER VISION 620 NEW 12" Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	£279 (a)
TAXAN SUPER VISION 625 NEW 12" Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	£329 (a)
MITSUBISHI XC1404 14" Med Res RGB Monitor Etched dark screen brilliance and contrast control, BBC/IBM compatible	£219 (a)

12" MONOCHROME MONITORS

TAXAN KX1201G Hi Res green etched screen	£85 (a)
TAXAN KX1202G Hi Res Long Persistence (P39)	£95 (a)
TAXAN KX1203A Hi Res amber etched screen	£95 (a)
PHILIPS BM 7502 Hi Res green screen	£75 (a)
PHILIPS BM7522 Hi Res amber screen	£75 (a)

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors)	£20 (c)
Philips Swivel Base	£14 (c)
Monitor Stand Models B & B +	£10 (c)
Monitor Stand Master	£13 (c)
Double Tier stand Models B, B + or Master	£24 (b)
Taxan RGB Lead	£5 (d)
Microvitec Lead	£3.50 (d)
Monochrome BNC/Phono Lead	£3.50 (d)

EPROMS/RAMS

2764-25	£2.50 (d)
27128-25	£2.75 (d)
6264LP-15	£2.80 (d)

RAM/ROM EXPANSION

ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2 8K Rams	£37 (c)
ATPL Battery backup kit	£16 (d)
ATPL Board for BBC + (now in stock).	£31 (c)

TIME WARP

Real Time Clock. Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program	£31 (d)
Time Warp with PANOS Utilities.	£39 (d)

MODEMS

(All modems are BABT approved)

MIRACLE WS2000V21/23 & BELL stds	£95 (c)
WS2000 Auto Dial Card	£27 (d)
WS2000 Auto Answer Card	£27 (d)
WS2000 SK1 Kit	£5 (d)
WS2000 Data Cable for BBC	£6 (d)
MIRACLE WS4000 V21/23	£169 (b)
MIRACLE WS3000 V21/23	£295 (b)
MIRACLE WS3000 V22	£495 (b)
MIRACLE WS3000 V22 bis	£650 (b)

The price of WS4000 and WS3000 modems includes a COMMSTAR II ROM and BBC data cable.

BBC Data Cable for WS3000/4000	£7 (d)

PROGRAMMING ACCESSORIES/SOFTWARE

See page 5 for detailed specification

Compatible with B, B + and Master

EPROMER II	£89 (b)
Eprom Ryter (Epromer III) Eprom Ryter is compatible with BBC Master only	£119 (b)
Upgrade of Epromer II to Eprom Ryter	£49 (b)
MPROMER	£49 (c)
META ASSEMBLER	£145 (b)
PORTAL EPROM EMULATOR 128/512K	£245(b)
TEAM Disassembler	£145 (b)

EPROM ERASERS

UV1B 6 eproms, safety cutout	£47 (b)
UV1T 6 eproms, timer, safety cutout	£59 (b)

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE
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CAD/DRAWING PACKAGES

NovaCad Cad Package for B, B+ & MASTER. (See page 5 for specification)

Tracker Ball/Mouse Version (TM)	£79 (d)
TM Version plus Tracker Ball	£119 (c)
TM Version plus Mouse	£105 (c)
Plotter Driver Generator	£25 (d)
MOUSE	
AMX MOUSE with SUPER ART (psc specify B, B+ or Master)	£63 (d)
PAGEMAKER	£39 (d)
EXTRA/EXTRA (utility for the Pagemaker)	£21 (d)
MAX	£17.35 (d)
STAND ALONE MOUSE (includes horizontal scroll lock)	£34 (c)
RB2 TRACKER BALL	
RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR incl VAT	£39.50 (d)

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for Acorn, Torch & Multiform Z80 Processors

MICROPRO's Wordstar Professional	£310 (a)
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Send for details on our full range of CP/M & PC DOS packages for Business, Communications & High Level Languages.

All software supplied by us is known to operate with the appropriate Acorn Disc filing systems. We **cannot** *comment on their use with other DFS systems.*

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DATABASE MANAGEMENT SYSTEMS

VIEWSTORE	£41 (d)
STARdataBASE	£39 (d)
MASTERFILE II	£17 (d)

WORD PROCESSORS

VIEW 2.1	£37 (d)
VIEW 3.0	£56 (c)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR	£7 (d)
DOT PRINT PLUS	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
WYSIWYG PLUS	£21 (d)
SPELLMASTER	£49 (d)
INTERWORD (If you own a WW+ then quote your reg number and pay £39).	£46 (d)
WORDEASE	£24 (d)
SPELLCHECK III	£31 (d)
EDWORD II	£43 (c)

SPREADSHEETS

VIEWSHEET	£41 (d)
WINDOWMATIC	£15 (d)
VIEWPLOT	£22 (d)
INTERSHEET	£39 (d)
INTERCHART	£27 (d)
ULTRACALC	£52 (d)
MINI OFFICE II (for BBC B) (40T OR 80T)	£14.75 (d)
MINI OFFICE II (ROM)	£48 (d)

LANGUAGES

META ASSEMBLER	£145 (b)
TEAM DISASSEMBLER	£33 (d)
MACROM	£62 (d)
ACORN MICRO PROLOG	£51 (c)
ISO-PASCAL	
ISO-PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL (40 or 80T) Specify B or B+	£36 (d)
OXFORD PASCAL for Master	£52 (d)
BCPL	£46 (c)
BCPL STAND ALONE GENERATOR	£39 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£43 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£43 (d)
MICROTEXT	£52 (c)
MICROTEXT PLUS	£229 (b)

COMMUNICATIONS

TERMULATOR	£25 (d)
COMMSTAR (Specify B or Master)	£28 (d)
COMMUNICATOR	£49 (d)
MODEM MASTER	£11 (d)
COMMAND (Specify modem type)	£34 (d)

COMPACT

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ARTROOM	£27 (d)
FONTWISE+	£22 (d)
FONT EDITOR	£22 (d)
RAMROD	£37 (d)
BROM PLUS	£32 (d)
MACROM	£37 (d)
BETABASE	£27 (d)
WHITE KNIGHT MKII	£16 (d)
BBC PUBLICATIONS BUNDLED SOFTWARE	£18.50 (d)

UTILITIES

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ACORN BASIC EDITOR	£24 (d)
MONITOR (BBC Pub)	£34 (a)
BROM PLUS	£26.50 (d)
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TOOLBOX 2 (BBC Pub) Manual Cassette	£9.50 (d) £9 (d)
EXMON II	£23 (d)
HELP II	£25 (d)
ACORN GXR GRAPHICS ROM specify B or B+	£24(d)
PRINTMASTER	£24 (d)
PRINTWISE	£24 (d)
DUMPMASTER	£26 (d)
FONTWISE PLUS	£17 (d)
HERSHEY FONT CHARACTER GENERATOR	£18 (d)
ICON MASTER	£29 (d)
MOVIE MAKER Two Roms + Cassette	£26 (d)
ADV TELETEXT UTILITIES ROM	£7.95 (d)

BBC PUBLICATIONS EDUCATIONAL SOFTWARE

A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

PRIMARY EDUCATION

ASTRONOMY	£11 (d)
COMPUTERS AT WORK Aud/EC/disc	£16 (c)
PICTURE CRAFT	Disc£17 (d)
INTRODUCING GEOGRAPHY	Disc£16 (d)
MATHS WITH A STORY 1	Cass£8 (d)
MATHS WITH A STORY 2	Cass£8 (d)
NUMBER GAMES	Cass/EC£7.50 (d)
USING YOUR COMPUTER	Cass£24 (c)

SECONDARY LEARNING

TECHNOLOGY & DESIGN Pt1	£21.50 (c)
ELECTRIC FIELDS	£10.50 (d)
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ADVANCED STUDIES: GEOGRAPHY	Cass£10 (d)
INSIDE INFORMATION	Prog Cass£10 (d) Audio Cass£5 (d) Book£8 (d)
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S.T.:WAVES	Disc£14 (d)
S.T.:RELATIONSHIPS	Disc£14 (d)
S.T.:BONDING	Disc£14 (d)
S.T.:ELECTROMAGNETIC SPECTRUM	Disc£14 (d)
S.T.:ELECTRONICS IN ACTION	Disc£14 (d)
S.T.:NEWTON & THE SHUTTLE	Disc£19 (d)
S.T.:ECOLOGY	Disc/EC£19 (d)
S.T.:POLYMERS	Disc/EC£19 (d)
S.T.:CLASSIFICATION & PERIODIC TABLE	Disc£20 (d)
S.T.:FOOD & POPULATION	Disc£20 (d)
SEC.SCIENCE MICROTECHNOLOGY	Cass£7 (d)
SEC.SCIENCE:THE MOLE CONCEPT	Disc/Aud/EC£16 (c)

GENERAL

VU-TYPE PROFESSIONAL	Disc£19 (d)
WHITE KNIGHT MK II (for compact)	Disc£16 (d)
BATTLEFIELDS	Cass£8.50 (d)
A VOUS LA FRANCE	Cass/EC£17 (d) Book£5.25 (d)
Additional charges for discs	£9.00 (d)
DEUTSCH DIREKT	Disc/aud/EC£16 (c) Book£5.95 (d)
MODEM MASTER	£11 (d)

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

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(c) £1.50
(d) £1.00

PRINTER ACCESSORIES

EPSON ACCESSORIES:

Interfaces:

8143 RS232	£30 (d)
8148 + RS232 + 8K	£65 (d)
8165 IEEE + Cable	£65 (d)
8132 Apple II	£60 (d)
8177P NLQ for FX80 + /FX100 +	£99 (d)

Parallel & Serial Buffers of various size also available.

FX80/80 + /85 Tractor Attachment	£29 (c)
LX80/86 Tractor Feed	£21 (c)
LQ800 Tractor Feed	£47 (b)
LQ1000 Tractor Feed	£52 (b)
EX800/1000 Colour option	£59 (b)
HI80 HP GL Emulation Rom + Ram	£63 (c)
HI80 Printer Emulation Rom	£38 (c)

SHEET FEEDERS:

8338 LX80	£52 (b)
8333 FX100 + /105	£169 (a)
8331 FX80 + /85	£129 (b)
LQ800	£135 (b)
LQ1000	£179 (b)
EX800	£135 (b)
EX 1000	£309 (b)
FX 800	£135 (b)
FX 1000	£179 (b)

Ribbons:

RX/FX100/100 + . FX105	£7 (d)
RX/FX80/80 + , FX85	£4 (d)
LX80	£4.50 (d)
LQ800	£8.50 (d)
LQ1000	£10 (d)
EX800/1000	£7.50 (d)
H180 Pen Set (Aqueous/Ball point)	£8.25 (d)

Dust Covers:

FX80	£5.50 (d)
TAXAN/Canon KP810	£6 (d)
FX100 £7.50 (d)	KP910 £7 (d)

HITACHI 672 Plotter

Aqueous Pen Set six pens	£18.50 (d)
Oil Based Pen Set six pens	£25.00 (d)

TAXAN CANON Accessories:

RS232 + 2K interface	£63 (d)
Ribbon, KP810/815/910/915	£6 (d)

Star Printer

NL10 Sheet Feeder	£52 (b)
NL10 RS232 Interface	£69 (c)
NL10 IBM Type Interface	£39 (c)
NL10 Ribbon	£4.50 (d)

National Panasonic KX P1080/81

Spare Ribbon	£4.50 (d)
Serial Interface	£39 (c)
KXP3131 Tractor	£90 (a)
KXP3131 Sheet Feeder	£189 (a)

JUKI 6100

RS232 Interfaces	£65 (d)
Tractor Feed	£149 (a)
Ribbon (Carbon)	£2.00 (d)
Spare Daisy Wheel	£14 (d)
Sheet Feeder	£182 (a)

BROTHER HR20

Daisy Wheel	£18 (d)
Tractor Feed	£116 (a)
Spare Ribbon Nylon	£3.00 (d)
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Spare Ink Cartridge Black	£9 (d)
Spare Ink Cartridge Colour	£15 (d)
Paper Roll	£7 (d)

Printer Leads:

BBC Parallel Lead (1.2m)	£6 (d)
BBC Serial (Epson) Lead (1.2m)	£7 (d)

Other lengths can be supplied on order:

IBM Parallel Lead (2m)	£12 (d)

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Plain Fanfold paper with micro perforations:

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Labels/1000:

Single Row 3½ × 1 7/16"	£5.25 (d)
Triple Row 27/16" × 17/16"	£5 (d)

WYSIWYG PLUS

WYSIWYG PLUS is a printer and screen utility for Wordwise Plus, View, Interword, and Basic users, supplied on a 16K Eprom. To obtain a particular printer effect, such as enlarged text, it used to be necessary to discover the appropriate 'printer control code' from your manual and incorporate it into your text. Secondly, you had to print several trial copies in order to position the effect correctly in relation to the rest of your text.

WYSIWYG PLUS simplifies this trial and error approach using easily remembered *commands. For example, *ENLARGED not only selects enlarged text on your printer, but uniquely shows you double width characters on your screen, even from within Wordwise Plus!

WYSIWYG PLUS incorporates a logo editor. Just draw your design on screen using the arrow keys, and save the results. Use the *GRAPHICS command to incorporate your design anywhere in your text; position and see your design in your text before faithfully reproducing a hard copy.

There is also special help for daisy wheel users. The *WHEEL command will prompt you to change daisy wheels whenever a change in type style is about to occur.

WYSIWYG PLUS is designed to work with the following systems:

BBC Model B
BBC Model B+
BBC Master 128
BBC Compact

6502 Second processor,
Turbo coprocessor
All printers (Except lasers)

WYSIWYG PLUS workspace is relocatable.

WINDOWMATIC

All users of Acorn's VIEWSHEET speadsheet program will be aware of its powerful windowing facility which allows the screen and/or printer to be configured in up to 10 seperate windows taken from anywhere in the sheet. They will also be painfully aware of how difficult and time consuming it is to set up a required display. Although VIEWSHEET allows configurations to be saved to the media, it does not have provision for deciphering them.

WINDOWMATIC has been produced with the intention of rectifying these shortcomings and to bring out the very best from VIEWSHEET.

WINDOWMATIC provides a quick and easy way to configure screen and printer allowing complicated documents and reports to be set up much more easily. It displays complete text information on all 20 windows and accurate graphic representation of the screen and printer output.

The package includes a screen dump routine for Epson printers and allows use of other printer dump packages.

WINDOWMATIC is compatible with BBC Master and BBC B+. A 6502 2nd processor must be fitted to a model B to run Windowmatic. Windowmatic is fully compatible with Turbo and 6502 2nd processor.

The program is supplied on disc with a comprehensive manual.

VU-TYPE

Do you have finger trouble when typing?
Do you letters look like this?

```
Dear Sor,
I wuold like to .....
```

then you need:

VU-type, a complete touch typing program produced by BBC/Pitman.

It allows you to learn at your own pace and has a wide range of exercises. Screen displays show the keys you have pressed and it will report on your speed and accuracy.

Supplied on a 40T Disc with a manual.

Available at a special price of £7.50(d) instead of the usual £15. Offer valid while stocks last

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Locomotion

These programs are supplied from the BBC Publications Educational Software range and will be supplied on a 5.25" disc for BBC Master, B+ and B and on a 3.5" disc for the Compact.

5.25" Disc	**£17.50(d)**
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(Normal RRP over £40)

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6502 Assy Lang Prog	£19.95
6502 Programming	£13.95
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NOVACAD

Computer Aided Draughting for the BBC Micro

> *"Novacad can drive a plotter to provide drawings of a high quality… Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use."* **Beebug December 1986**

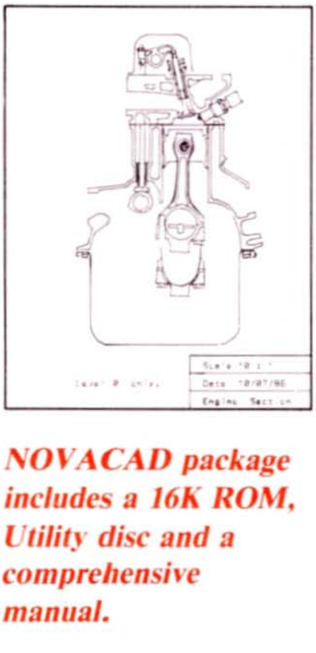
> *"Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market"."* **A&B Computing August 1986**

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

NOVACAD'S MAJOR FEATURES

- Simple and easy to use with logical command sequence.
- A large drawing area (approx 15 screens).
- The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
- A zoom facility allowing magnification of up to 20 times to insert finer details.
- Block copy of shapes on the screen for repetitive use.
- Text entry at any 90° orientation at any position on the screen.
- Create multi layer drawing with 8 levels available.
- Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
- Printer routine for Epson 80 and 136 column printers.
- A unique optional facility to output to any BBC compatible plotter.
- Cursor control from keyboard, tracker ball or mouse.



NOVACAD package includes a 16K ROM, Utility disc and a comprehensive manual.

MINIMUM HARDWARE REQUIREMENTS

- **Any BBC range computer with Acorn DFS.**
- **40 Track single sided single drive.**
- **Epson compatible dot matrix printer.**

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.
ROUTCAD, an optional software package for our Graphics Workstation allows for production of shapes drawn using NOVACAD in 3D on suitable material and is ideal for a range of applications including template making and model building.

EpromRyter

A powerful eprom programmer for use with the BBC Master. It offers the latest 'state of the art' programming techniques to provide fast and efficient operations.

The software is totally menu driven and on screen help messages make the programming simple for both specialists and novices alike.

The EPROMRYTER interfaces with the Master through 1 MHz bus. It is mains powered with its own psu. 3M Textool zif socket has been fitted to ensure consistent and reliable service over long periods.

The single rail eproms handled by the EpromRyter are:
● 2716 2732 2764 27128 27256 27512 27513 27011
2516 2532 2564 (NMOS & CMOS)
● One time eproms P27XXX, 87CXXX etc.
● Also A suffix eproms such as 27XXXA

The main features of the programming software are:

- Device, function and voltage selection from the computer keyboard.
- Continuous display of the options selected.
- All eproms upto 27512 (64K) programmed in single pass.
- Automatic Intelligent identifier support for eproms able to respond.
- Selectable programming voltage 25/21/12.5V
- 3 programming methods: Normal, Intelligent & Pulse (20 sec for a 27128).
- Serial port protocols supported.
- Intel HEX, Motorola S, HEX and ASCII protocols supported.
- DFS, NFS, ADFS and Rom Filing System Supported.
- BASIC/Machine Code programming using RFS.
- Powerful editor with input in HEX or ASCII. * Full editable 64K file.
- Block move of data within the address range.
- User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
- Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER II

A proven Eprom programmer for BBC Model B and B+ with thousands in use in industry, educational and R&D establishments. It offers many of the powerful features of the EpromRyter and can program all single rail eproms upto 27256. Full details on request.

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FREE MASTER OFFER

Every Master and Master Compact purchased at our usual price will include the following:
An educational/fun bundled software package comprising of **VU-Type, Wordmover, Wordplay, Drawstick, Locomotion and Pantry Antics**

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach." **Acorn User October 1986**

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

3½ DISC DRIVES

- 400K/640K capacity per drive in DFS/ADFS modes
- Mitsubishi 80 track double sided ultra low power, fast access mechanisms
- The drives are supplied fully cased and with cables ready for connection to a computer
- Drives powered from the computer
- 2 years warranty

Single Drive £75(b) Dual Drive £134(b)

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc):

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

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ADE+

Features

- Runs on BBC B, B+, Master, Compact, ADFS, DFS, ANFS, NFS
- Full use of all available RAM
- Intelligent memory management unit (MMU)
- User switches on all main features
- Automatic search for macros on disc
- Assemble absolute or relocatable code
- Source program tokenised or full text
- REPEAT..UNTIL, WHILE..WEND etc. high level language constructs
- Macros nestable to any depth
- Excellent error diagnostics
- Linker
- Editor and symbolic disassembler provided

A comparison of three 65C12 assemblers

Feature	ADE +	BBC Basic	MACROM
Number of pseudo-ops	64	4	36
Use of all available RAM	Yes	No	No
Macros	Yes	No	Yes
Relocatable output	Yes	No	No
Linker with libraries	Yes	No	No
High level constructs	Yes	Yes	No
Number of error reports	39+warnings	3+BASIC errs	20
65C00 extended opcodes	All	65C 12 only	65C12only
Switch off 65C 12 opcodes	Yes	No	No
ROM size	32K	16K	16K
Disassembler	Yes	No	Yes
Label restrictions	No	Yes	Yes

ADE+

Versions and prices

Recommended for Master Compact...
ADE+ MMU and 65C00 series assembler on disc (3.5" ADFS). 32K sideways RAM required.
£42.00 + vat

Recommended for BBC B, B+ ...
ADE+ MMU and 65C00 series assembler on 2 16K EPROMS with DFS 5.25" utilities disc.
£46.00 + vat

Recommended for Master 128, turbo..
ADE+ MMU and 65C00 series assembler on EPROM cartridge with 5.25" DFS utility disc.
£49.00 + vat

Upgrade
ADE to ADE+ (upgrade to either disc, EPROM or cartridge, you must send in ADE ROM chip)
£27.00 + vat

Upgrade
ASM to ADE+ (upgrade to either disc, EPROM or cartridge, you must send in ASM ROM chip)
£35.00 + vat

Please add £1.25 P&P per unit.

ADE+

The Ultimate Assembly Language Development Tool

ADE+ is a 65C00 series assembler system supporting all the mnemonics of the 65C12 used in the latest BBC microcomputers plus the additional 'Rockwell' instructions. ADE+ is fast, faster in fact than the in-built BASIC assembler and all rival products that we have tested. The assembler produces absolute code that can be *RUN or linker modules that can be merged with the output from other programs using the ADE+ linker. ADE+ supports a powerful linker which drastically cuts assembly time; a feature normally only found on minis and mainframes. The linker will even link the output from compilers with your assembly language programs. Full library support for both the linker and the assembler is provided - fast searching for unknown instructions in a random access macro library. ADE+ is a modular system with many modules to add later; i.e. a mouse based editor & a Z80 cross assembler! A print spooling system uses sideways RAM as a print buffer to eliminate waiting time; your listing runs off as a background job! Use the print spooler from BASIC or your own programs. ADE+ uses ALL available memory. With a second processor attached the IO processor spare memory is used as a buffer to reduce the amount of disc access. All available memory is handled by ADE+'s intelligent memory management module. Use your own favourite editor or the one provided. Assemble from disc or memory. Full utilities including librarians, converter for BBC BASIC etc. ADE+ must be *the* bargain of 1986/7!

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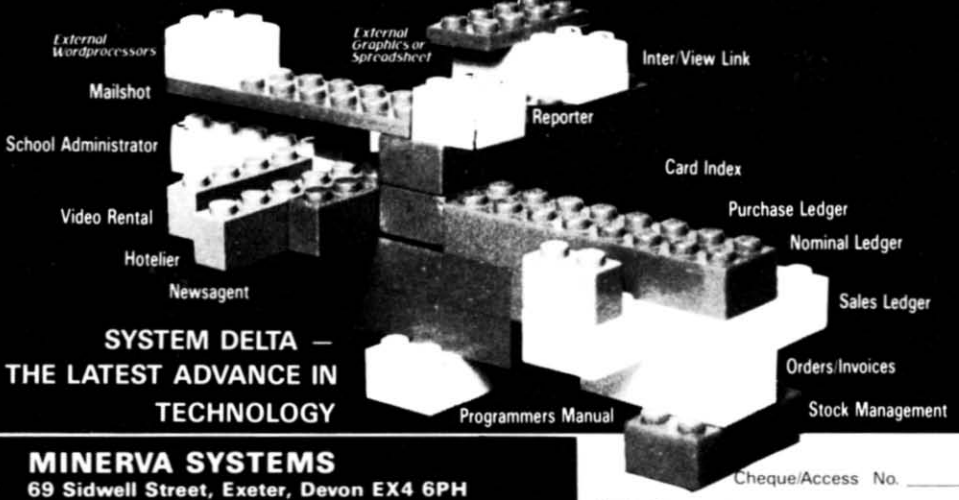

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DDS offer you branded SCOTCH (made by 3M) at prices below other people's plain label disks. They're certified & tested error free by 3M; branded disks in tyvek envelopes with re-inforced hubs, labels & WP tabs are also included.

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50 disks	69.99	79.99
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200 disks	249.99	289.99
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Offer 6

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Guide McBrolly through the

MAD MAZE

By Gordon Key

PROFESSOR McBrolly has been preparing a new type of kiwi fruit jam, but all his jam pots have been stolen by the Jelly Goblins.

Desperate to pot his new preserve, the professor – armed with his trusty umbrella – has entered the Jelly Mines and you must help him recover his jam jars.

The Jelly Goblins are keen on acrobatics and scattered through the Jelly Caverns are trampolines – just jump up and down on one to get up to the higher levels.

The jam pots can be seen hanging on the walls and the Prof has to jump off the high levels to recover them. But make sure he uses his brolly to break his fall.

Most of the Jelly Caverns are safe to travel through, but watch out for the areas of Jelly Slime that spreads across the floor. When it's blue you can cross it in safety, but if it turns red poor Professor McBrolly will lose a life.

The program is quite long, but you can check your listing against the checksums provided. Before running it save a copy because after initialising itself the program deletes over 50 per cent of its own code.

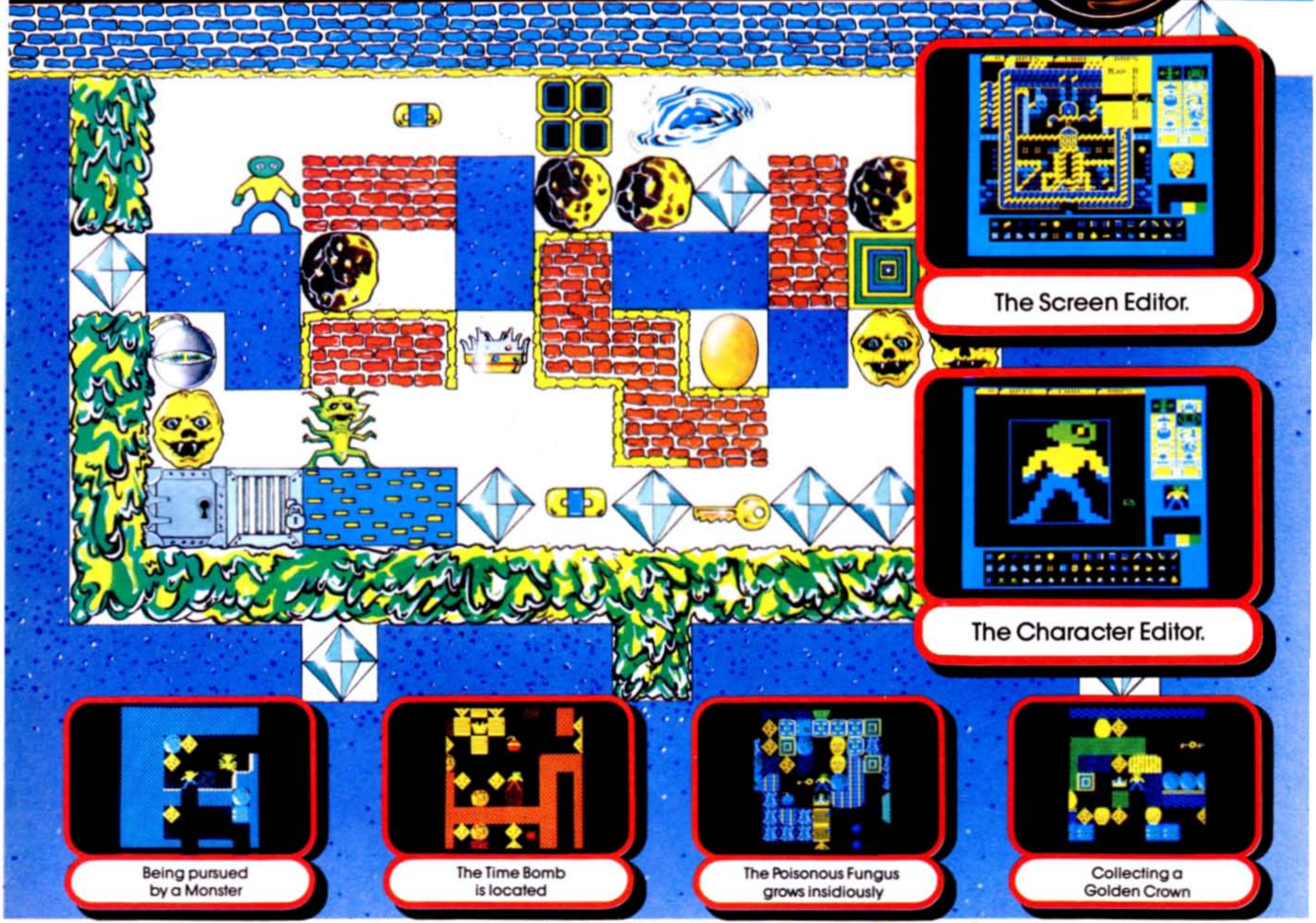
Full instructions for the controls are in the game.

Full listing starts on Page 157 ▶

For the COMMODORE, AMSTRAD, BBC MICRO, ELECTRON

REPTON 3

THE ULTIMATE CHALLENGE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The Time Bomb is located
The Poisonous Fungus grows insidiously
Collecting a Golden Crown

Are you ready for the ultimate challenge?

Our original Repton game was immediately acclaimed as a refreshingly new concept: a game requiring dexterity to complete its arcade-style elements, and clear logical thinking to solve its strategic puzzles. Repton involves retrieving treasure from cleverly-constructed traps of falling rocks whilst avoiding the fearsome monsters and haunting spirits. "This is an astounding game reaching new heights in BBC arcade adventures," enthused the Micro User magazine.

Last Christmas saw the release of Repton 2, larger and much more challenging than before. Acorn User's Technical Editor Bruce Smith wrote: "Repton 2 is better than anything I've played on the BBC Micro or Electron. Brilliant!"

Now, completely rewritten and improved for the Commodore, Amstrad, BBC Micro and Electron, we proudly present Repton 3. For the first time, a screen-designer is included: try to devise screens that will perplex your friends, then see if you can solve their newly-designed screens. Another innovation is the character-designer which enables you to design your own monsters, rocks, eggs, spirits, diamonds . . . any or all of the game's characters can be redefined as you wish.

Repton 3 is much larger than its predecessors — it has 24 fascinating screens, and players who are skilful enough to complete them all can enter our prize competition described below. All the favourite Repton characters have been retained, together with several new features: a creeping poisonous fungus which grows at an alarming rate; time bombs and time capsules (for puzzles in the 4th dimension); and golden crowns as well-deserved rewards for your endeavours. **Can YOU complete Repton 3?**

PRIZE COMPETITION

If you complete Repton 3, you can enter our competition. Prizes include over £200 in cash, with T-shirts, mugs, badges and pens for runners-up.

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The screen pictures above show the BBC Micro version of Repton 3.

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NEWSLETTER

Chess goes on Email

SCHOOLBOY Michael Hennigan has emerged triumphant at the end of the first major chess tournament conducted via electronic mail.

Michael, aged 16, from City of London School beat Aaron Summerscales, 17, of Elliot School, Richmond, in the final of the British Chess Federation under-18 quick play individual championships.

The last three rounds of the tournament, which attracted 560 entrants, were staged on the MicroLink system and shown move by move on national television.

MicroLink provided individual electronic mailboxes for each competitor and linked them to Ceefax on BBC Television. Every move in each game was shown as it happened.

Moves were transmitted between opponents as MicroLink express mail messages, at the same time registering at Ceefax and with the match arbiter.

It was a major test of MicroLink's speed and efficiency – the eight competitors in the quarter finals came from places as far apart as Edinburgh, Cardiff, Belfast and London.

Lincolnshire primary school headmaster John Tonkin, who organised the tournament, said afterwards: "It was a great success. Technically, the MicroLink system was absolutely spot on.

"MicroLink and Ceefax provided a fitting stage for our junior players to demonstrate why they are second only to the Russian youngsters in the world of chess these days".

Typesetting on the line

ONLINE typesetting is coming into its own as an alternative to traditional methods, and MicroLink is playing its part in this booming growth area of commercial printing.

Many small businesses which require professional-quality printed material but can't afford the cost in time and money of manual typesetting are turning to firms like Wordstream for help.

This Bournemouth-based company, owned by husband and wife team David and Jackie Furlonger, provides a service via electronic mail with a choice of 150 different typefaces.

Wordstream is online 24 hours a day, seven days a week, offering next day results at only a tenth of the cost of traditional typesetting.

Eighteen months after its launch, Wordstream has chalked up its 1,000th customer, and now the firm is going international via MicroLink.

Primary targets are Europe, where MicroLink has many subscribers, and the USA.

Specially developed MicroLink technology will enable the contents of Wordstream's mailbox to be downloaded automatically every 15 minutes of the day or night and transferred directly on to typesetting equipment for processing.

MICROLINK enthusiast Dave Oborne thought he had found himself playing a role in a drama when he logged on to his mailbox late one night.

As he was reading his mail another subscriber broke in with the terse message "Help!".

"I felt echoes of Tony Hancock getting the Mayday emergency call in his famous radio sketch", David said later. "But it proved to be a request for help from someone who wanted to send an urgent Telemessage and wasn't sure how to go about it.

"I was pleased to put him on the right track, but a little disappointed it wasn't as dramatic a situation as I imagined it was going to be".

Messages get a bright new look

FIVE new designs have been created for the colourful Telemessage greetings card series which is available through MicroLink and covers a variety of special events including births, weddings and coming of age.

Among them is a reproduction of Renoir's famous boating scene The Seine at Asnières. It replaces the longest serving Telemessage card – a pastoral scene of butterflies and flowers that has been a favourite since 1981.

Telemessage now has 14 different card designs to meet a wide variety of needs like business announcements, birthdays, anniversaries, get-well-soon messages and condolences.

Only 13 are available to the public, however – the other card is exclusive to The Queen who uses it to send her personal greetings to people celebrating their 100th birthday or diamond weddings.

It costs as little as £2.20 to send a Telemessage greeting card via MicroLink.

TRADE LINK

DESPITE the difficulties caused because some manufacturers refuse to trade with South Africa, micro users in that country have to soldier on regardless.

One of them, computer consultant Steve Crawford, has joined MicroLink in order to improve his links with hardware and software suppliers in Britain.

"When you have the situation where leading firms have cut their ties with South Africa for political reasons it is essential to explore other avenues of supply", he says.

"MicroLink telex and electronic mail services are the most economical and efficient methods of contact between people like myself and UK suppliers.

"Current circumstances would otherwise make it impossible to obtain new or replacement hardware and software which those in favour of the boycott should remember are just as essential to the opponents of apartheid".

YOUR chance to join MicroLink – turn to Page 127

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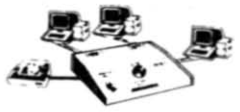

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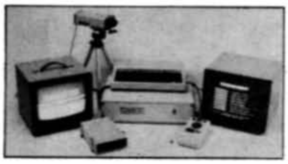

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Blow your own roms

Steve Turnbull evaluates a package for the serious programmer

SINCE the advent of the BBC Micro and it use of sideways roms, blowing eproms has become a popular pastime among commercial software producers and individuals making their own roms.

The Technomatic EpromRyter is a very sophisticated package which allows you to blow any type of rom very quickly. This version is an upgrade on the Epromer II and if you have Epromer II with a B or B+ you don't need to upgrade since the new features only work on a Master.

But for anyone who has a serious need to blow roms of any type this is definitely the best buy.

The box contains the blower itself, a disc of software and a manual. The blower immediately strikes you as a well-produced, solid piece of kit and the software only requires booting.

First of my very few niggles lies with the manual. It is made up of 17 rather scrappy A5 photocopied pages stapled in two places. It is not well written and gives only a brief description of each function.

It doesn't tell you how each of the options available interact with each other, leaving you in doubt as to exactly what to do next.

The manual warns that pressing Break will damage your eprom, but when I experimented (accidentally) it caused no problems. I still wouldn't recommend the practice.

Once into the software all options are selected via interlinked menus. Your first task is to select the type of eprom to be blown.

With the EpromRyter the choice is astonishingly large. Technomatic seems to have catered for virtually every eprom ever produced, and even some yet to be released.

You can choose eprom sizes up to 1 megabit (128k), and modern devices can identify themselves to the Eprom Ryter so you don't have to tell it exactly what you have plugged in.

The hardest part of this section is selecting the voltage level, for unless you know the right level for the device you are using you can cause damage. You will need some sort of data sheet for each type of eprom you use.

The next thing to do is get the data to be blown. Again you have excellent scope, as the software accepts files of data from the various filing systems, from the current eprom plugged in and from the RS423 port.

When selecting the Filing System, EpromRyter always has ADFS selected, instead of using an operating system call to find out which is the current system. Since I was using the DFS I had to re-select DFS every time I reached this point – simple enough to do but annoying.

As the data is being loaded in you have the choice of keeping it exactly as it is, or having it formatted to conform to the BBC rom filing system format. In this case EpromRyter adds its own standard rom header.

Another niggle. When adding files you can just keep adding more and more – you are not warned when you are about to overrun the eprom size.

I found this particularly annoying when creating an RFS rom image of various Basic programs, only to find that I had overrun and had to go back and calculate by hand the lengths of the files and how much I could get in the rom.

There are options to save the formatted image, so the software alone is handy for creating the RFS rom image.

Ultimately we reach the burn stage, a curious name since everyone else calls it blowing. You are provided with three ways to burn an eprom.

First there is Normal, which is very slow and only included for completeness; it takes 50ms per byte which is eight minutes for an 8k eprom. Then there is the Intelligent method, which takes two minutes for 8k and will work perfectly on any eprom, making the Normal method redundant.

Finally there is the Pulse method, which takes just 15 seconds for 8k. Only modern devices will take the written data permanently using this method; older eproms will hold it for six to eight weeks, which can be useful if you are doing a quick test.

Apart from these standard and necessary options, the EpromRyter provides a quite sophisticated memory editor, an option to verify an eprom to ensure it is blank or the same as memory contents. You can also get a checksum on the eprom contents.

Apart from a few minor niggles, I found this eprom programmer to be one of the simplest, easiest and most comprehensive I have used. The price is quite high, but fair considering the facilities.

Product: EpromRyter v 3.0
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Mike Cook takes a detailed look at the development of the rom family

Holding it all together

THE read only memory (rom) is an essential component of all micros because it holds programs and data even when the computer is turned off. It comes in all sorts of guises, the most common being rom and eprom.

However, the story of the rom as a circuit element has a much longer history than its use in micros, so let's see exactly what it is composed of.

First of all we need to define our terms. A rom is composed of logic circuits, of which there are two classes – combination logic and sequential logic.

The former consists of a number of logic gates with outputs of one connected to inputs of the next. If you were to draw the circuit of a piece of combination logic the inputs would be on one side and the outputs on the other, and the signals would flow one way.

If you consider the whole combination logic circuit as a black box the signals coming out would depend only upon the current state of the signals going in. With the same input conditions you would always get the same output.

Sequential logic on the other hand has some feedback, that is some outputs are connected back to the inputs. If you were to consider this as a black box the output would depend not only on the current state input but also on its past states.

Counters, shift registers and rams are all examples of sequential logic, whereas decoders, multiplexers and roms are all examples of combination logic.

The most usual form of combination logic is the rom and it is basically built from a multiplexer and a de-multiplexer. These are simply fancy names for switches. If you look at Figure I you will see an example of each with the switch equivalent.

The position of the switch is controlled by the logic levels on the select lines. If you were to make this out of a real switch you would need only one device, but because in logic gates signals can only flow in one direction, we need two.

To make these into a rom we need to take the outputs from a de-multiplexer and lay them over the inputs of a multiplexer. This forms what is known as a matrix. Note these do not make connection where they cross.

At some matrix intersections we place diodes – devices that will allow a current to flow through in only one direction, a sort of non-return valve. Figure II shows a simple rom. At the input of the multiplexer we place a logic zero. This means that we can place the logic zero on any column by the logic levels on the multiplexer select lines.

Similarly any row can be transferred to the output by the logic levels on the de-multiplexer. Now if we have a diode wired at the currently selected column and row intersection we get a logic zero as an output; if there is no diode we have a logic 1.

If we consider our select lines as the input to our circuit we can define the output simply by connecting, or removing, a diode at the appropriate intersection. Figure II has 16 possible input conditions, each corresponding to a separate column/row intersection.

If you can't see why the diodes are needed, try replacing them with connections and see how the signals can weave between columns and rows to reach the output.

Now this simple circuit is a 16 x 1 rom (pronounced 16 by one). That means there are 16 possible input combinations and one bit output. Note we have 16 combinations defined by four select lines, simply (two to the power four).

These select lines are usually called address lines and most roms have more than four. By using bigger multiplexers and de-multiplexers we can have bigger matrices and more address lines.

However, one bit per address is not usually much use so several of these circuits are used with all the address lines connected together and the outputs separate. Figure III shows a 16 x 4 rom constructed from four 16 x 1 roms

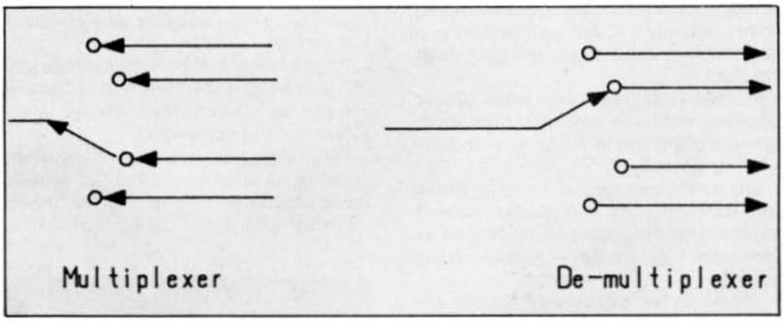

Figure I: Switch equivalent circuit

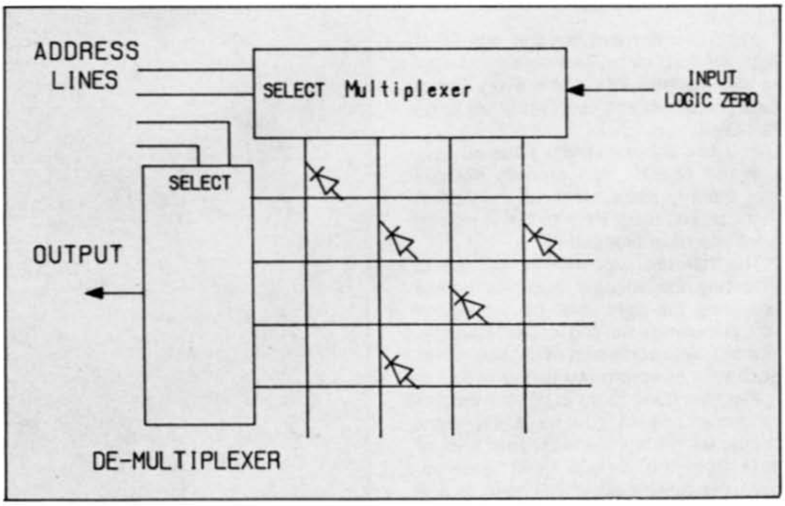

Figure II: A 16 × 1 diode matrix rom

shown in Figure II.

As we get bigger roms we need more and more diodes. Early diode matrix roms had these wired on large cards, the placing of the diodes determining the contents of the rom. Often roms were used simply to replace a collection of logic gates or perform signal decoding.

With the advent of integrated circuits, very small roms could be made, and with a large number of address lines. There were some standard roms like character generators for VDUs, but in the main each customer wanted a different pattern for his own product.

Integrated circuits are made by photo-etching a series of patterns in silicon, with each pattern produced by a photographic mask. The last mask used in the process determines how all the circuit elements are joined up. What the semiconductor manufacturers did was to place a diode at each matrix intersection, the final mask determining whether it was connected up.

This meant that all roms could be made the same until the final mask. This is known as a mask programmable rom, the type of rom you are most likely to find holding the operating system and Basic. They are cheap but only in large quantities as there is a heavy mask-making charge. Therefore they are ideal for large quantities of debugged software.

When you are developing a rom you obviously don't want the heavy cost of making a mask every time you have a new version so there are a few cheaper alternatives.

The first of these to be made was the fused-link prom (programmable read only memory). In this each intersection would have a diode and it was connected up by a thin link of nichrome metal, so that the whole rom consisted of logic zero outputs.

To program the device to give a logic one the appropriate intersections were selected on the address lines and a large surge of current sent through the links. This current caused the metal to heat up and melt, and once molten the surface tension pulled the link apart – you had literally blown the fuse. This is where the term blowing a rom originated although the way it is used today is really quite wrong.

The major problem with a fused-link prom is that once the link is blown it can't be replaced. If you want a different pattern you have to throw it away and get a new one.

When placing software on rom mistakes frequently occur so the eprom was developed erasable programmable read only memory. In this the fuse link is replaced by a Field Effect Transistor (FET) which is simply an electronic switch.

The switch is on if there is a voltage on the gate connection and off if there is no voltage. This type of transistor can be made to use virtually no current at all, so if you connect a charged capacitor to its gate you will have a permanently closed switch as shown in Figure IV.

Initially all the capacitors are discharged; you can induce a charge on any one by selecting the appropriate address and pulsing a special programming line. This places a small charge on the capacitor and turns on the switch.

In practice the charge will slowly leak away so anything placed on a eprom will only stay there for about 30 years – long enough for it to become obsolete several times over.

To reprogram eproms you have to remove the charge on all the capacitors, by shining ultra-violet light on the chips through a small quartz window. I call this giving them a sun tan but what really happens is that the ultra violet light makes the dielectric of the capacitors conduct so that the charge leaks away.

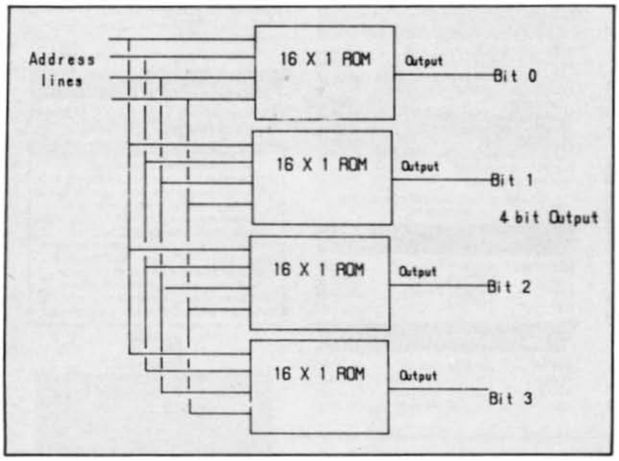

Figure III: A 16 × 4 rom

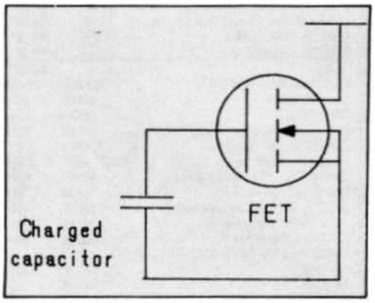

Figure IV: An eprom switch

The dielectric is the insulating material between the two plates of the capacitor. The way the ultra violet light makes the dielectric conduct is by kicking the electrons in the silicon into a more energetic orbit. There they are less closely bound to the atom and can wander off and form an electric current.

The point about an eprom is that it all has to be erased at once, and to make the exposure to ultra violet light it has to be removed from the circuit. Also the programming is normally done out of the final circuit.

It would be useful in some circumstances if individual address locations could be reprogrammed without removal from the circuit. This has been achieved in the eeprom (electrically erasable programmable read only memory).

This acts like normal read/write memory only it is non-volatile. This means that when the power is removed it still retains its bit pattern.

This is achieved like the eprom with charge stored on a capacitor only this time the charge can be removed by FETs one cell at a time. However, not many of these devices have found their way into computers, although the Compact uses an eeprom to store its start up options.

The reason for this is that due to the complexity of the circuit you can't pack as much data on a given size chip as you can with eproms. The result is that eeproms are expensive and have a small capacity.

Current prices are about £10 per k of storage as opposed to 20p for conventional eproms. A further disadvantage is that when writing data into eeproms the devices are slow.

It takes about 1ms to write data to an eeprom but they can be read at speeds approaching that of normal memory that is about 500ns.

The trend seems to be towards bigger and cheaper eproms that require less stringent programming voltages. Clive Sinclair has even utilised eproms as the mass storage device in his new laptop computer. Despite that eproms will be around for a long time yet. ■

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Double-barrelled fire power

Chris Nixon gives the Compact a second fire button

IF you are lucky enough to have one of the new BBC Master Compact micros, you may have noticed that the old BBC ADVAL command seems to be fully supported, despite the lack of an analogue port for the joystick.

What Acorn has done is to replace the old high quality analogue port with a more conventional Atari-type digital joystick port – this is in fact the user port that at first sight seems to be absent from the Compact.

What is missing is the second fire button – and this is what this utility, the Button rom, provides.

The difference between the digital and analogue ports is that the latter gives back a voltage proportional to how far left, right, forward or backward the joystick is positioned. A digital port provides only voltages showing whether the joystick is left or right, forward or backward.

With a little rewriting of the operating system, the Compact responds to a digital joystick by gradually increasing or decreasing the values of ADVAL 1 to 4 according to how long the stick is held in a particular position.

These values correspond to those returned by the original ADVAL command, except that on the Compact they change progressively and at a constant rate. A proper analogue port would produce virtually immediate changes related to the physical position of the stick at any one time.

All well and good, but in the process one of the two fire button inputs present on the Model B and Master has been sacrificed. This means that if you happen to have an Atari-type digital joystick with two fire buttons, it is impossible to return values 2 and 3 which indicate the second button has been pressed.

Unfortunately there is a lot of software which relies on the two fire buttons being present. Software written for the disabled, for instance, often uses the two fire button inputs wired to large switches as a means of controlling anything from special word processors to drawing programs.

Even some games, such as SQWHERE from the August 1984 issue of *The Micro User*, use the two fire buttons to control the action.

So what can you do if you have bought a Compact and want to transfer these otherwise compatible programs to the Compact's 3.5in ADFS disc?

The Button rom solves all these problems in one go. Without affecting the way in which the joystick is read, it will return the proper values of 0, 1, 2 and 3.

To do this we must cheat a little. The two fire buttons are simulated by pressing the joystick left for a value of 1, right for a value of 2 and down for a value of 3.

However, if you construct a proper two-switch box with two buttons connected respectively to the joystick left and right inputs, the Button rom is designed to return a value of 3 if both keys are pressed simultaneously.

As its name suggests the Button rom is actually a full sideways rom, although rather shorter than you might expect. You don't need to rush out and buy an eprom blower though, as this program lives in one of the Compact's four sideways ram banks but behaves exactly the same as a rom chip.

Once loaded, the Button rom will remain active until the computer is turned off. To use it, type in the program and save it with a suitable name such as Button–Src. Do not use the filename Button as the assembled machine code is called this when it is saved.

To load the Button rom into sideways ram type:

```
*SRLOAD Button 8000 4 I
```

This translates as load the file Button into sideways ram socket 4, and the I means initialise it as a recognised rom.

To activate the Button rom use the command *FIRE. Pressing Break or Control+Break will deactivate the rom.

You can make the load and initialise commands part of a !Boot file by copying the file Build from the Welcome disc to the Button disc and typing:

```
*BUILD !Boot
0001 *SRLOAD Button 8000 4 I
0002 *FIRE
0003 CHAIN"game"
0004 (Escape)

*OPT4 3
```

The Button rom works by intercepting all calls to osbyte &80 (read joystick value) via the osbyte vector *bytev*. This will trap all attempts to read the fire buttons, from both machine code and Basic.

The address stored in *bytev* which normally points into the operating system osbyte routine is changed to point to the Button roms checking routine.

If the accumulator does not contain &80 the program jumps to the original osbyte routine. If the accumulator does contain &80 but the X register does not contain 0 the operating system wants to read the joystick position so we must again exit to the original routine.

Having reached this position we now simulate the fire buttons. We read the relevant bits of the user port (joystick port) and place the fake value in the X register before returning control to the operating system.

Without going into the ins and outs of the 6522 VIA chips the five lower bits of the user port correspond to the four joystick switches and one fire button. They are clear if the corresponding switch is pressed and set if it is not. Details of the joystick connections can be found in Appendix 11.1 of the Compact Welcome Guide.

The Button rom, like all roms, will respond to *HELP with a short message and if Control+Break is pressed it will display its presence at the top of the screen above Acorn's own chip messages.

The beauty of this system is that no ungainly interrupt routines are necessary, nothing is interfered with, and only two bytes of the computer's memory are needed for workspace.

Turn to Page 126 ▶

◀ From Page 125

```
   10 REM ***********************
   20 REM *   The Button ROM    *
   30 REM *                     *
   40 REM *  Dual Fire Button   *
   50 REM * Simulator for the   *
   60 REM *    Acorn Master     *
   70 REM *      Compact        *
   80 REM *         by          *
   90 REM *    Chris Nixon      *
  100 REM *    January 1987     *
  110 REM * (c) The Micro User *
  120 REM **********************
  130 REM
  140 MODE7:DIM CODE% 2000
  150 FORPASS=4TO6STEP2
  160 P%=&8000:O%=CODE%:ptr=&9A
  170 call=&9C:value=&9D
  180 [OPT PASS
  190 EQUW0:EQUB0:EQUB&4C:EQUW service
  200 EQUB&82:EQUB offset MOD 256:EQUB1
  210 .title
  220 EQUS"The Button ROM":EQUB0
  230 EQUS"Version 0.1"
  240 .offset
  250 EQUB0:EQUS"(C) The Micro User 1987
  260 .service
  270 STA call:TXA:PHA:TYA:PHA:LDA call
  280 CMP #1:BNE offercall
  290 JSR printname:JMP notserviced
  300 .printname
  310 LDX #0
  320 .titleloop
  330 LDA title,X:BEQ exittitle
  340 JSR &FFE3:INX:JMP titleloop
  350 .exittitle
  360 JMP &FFE7
  370 .notserviced
  380 PLA:TAY:PLA:TAX:LDA call:RTS
  390 .serviced
  400 PLA:TAY:PLA:TAX:LDA #0:RTS
  410 .offercall
  420 CMP #4:BNE checkhelp
  430 LDX #0
  440 .checkloop
  450 LDA (&F2),Y:CMP #13:BEQ wascall
  460 ORA #32:CMP command,X
  470 BNE notserviced:INY:INX
  480 JMP checkloop
  490 .wascall
  500 LDA &20B:CMP #divert DIV 256
  510 BEQ skipvector
  520 LDA #&A8:LDX #0:LDY #&FF:JSR &FFF4
  530 STX ptr:STY ptr+1
  540 LDA &20A:STA &9E:LDA &20B
  550 STA &9F:LDA #&0F:STA &20A
  560 LDA #&FF:STA &20B:LDY #15
  570 LDA #divert MOD 256:STA (ptr),Y
  580 INY:LDA #divert DIV 256
  590 STA (ptr),Y:INY:LDA &F4
  600 STA (ptr),Y
  610 .skipvector
  620 JMP serviced
  630 .checkhelp
  640 CMP #9:BEQ washelp:JMP notserviced
  650 .washelp
  660 JSR &FFE7:JSR printname:LDX #0
  670 .showinfo
  680 LDA info,X:BMI exitinfo:JSR &FFE3
  690 INX:JMP showinfo
  700 .exitinfo
  710 JMP notserviced
  720 .divert
  730 CMP #&80:BNE exit:CPX #0
  740 BNE exit:SEI:LDA #0:STA &FE62
  750 LDA &FE60:EOR #&FF:STA value
  760 CLI:AND #18:CMP #18:BNE checkleft
  770 LDX #3:RTS
  780 .checkleft
  790 LDA value:AND #2:BEQ checkright
  800 LDX #1:RTS
  810 .checkright
  820 LDA value:AND #16:BEQ checkboth
  830 LDX #2:RTS
  840 .checkboth
  850 LDA value:AND #4:BEQ none
  860 LDX #3:RTS
  870 .none
  880 LDX #0:RTS
  890 .exit
  900 JMP (&9E)
  910 .command:EQUS"fire"
  920 .info
  930 EQUS"By Chris Nixon"+CHR$13+"(c) T
he Micro User"+CHR$13+"(*fire)"+CHR$13+C
HR$255
  940 ]
  950 NEXT
  960 OSCLI"SAVE BUTTON "+STR$CODE%+" "
+STR$O%+" 8000 8000"
```

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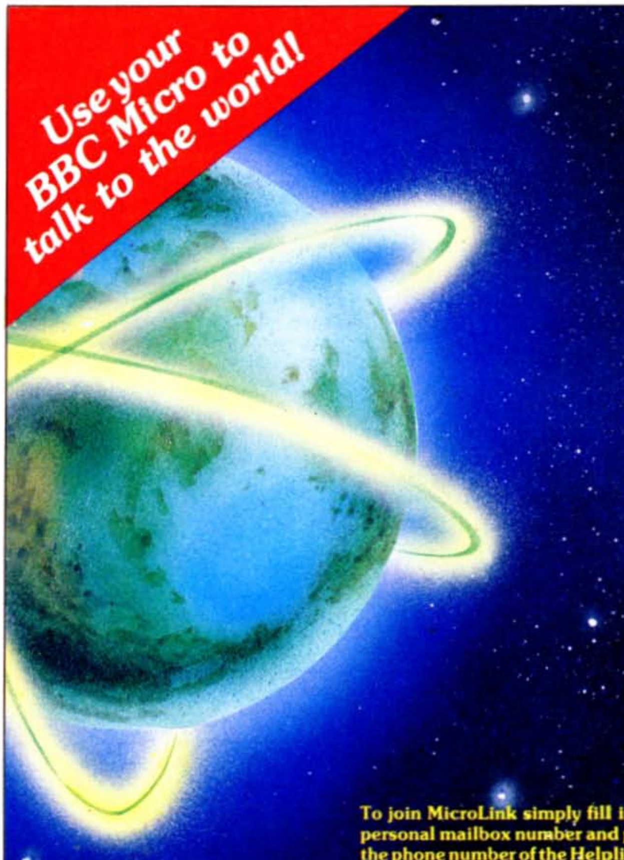
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MU5

Brian Matthews gets sideways roms to behave correctly

Calling for rom service

WHEN the fledgling BBC Micro was released on an expectant world possibly its most innovative feature was the ability to support sideways roms.

These are read only memory chips which plug into the empty rom sockets. All occupy the same area of memory in the micro – &8000 to &BFFF – but only one can occupy the space at any one time.

More recently computer companies have been providing sideways ram to enhance the BBC Micro, allowing a rom image to be loaded in and run as if it were permanently inserted into the computer.

This feature is available as standard on the Master and Compact complete with special commands to load and save to sideways ram, as it is called.

Everything in this article applies equally to roms and rom images to be loaded into sideways ram.

To access roms the computer moves each rom in and out of the memory map as and when required. This system of paging roms is widely exploited by computer users and software producers alike, and the technique has been copied in other micros.

Your micro is run by a central program called the Machine Operating System (MOS) that acts as a caretaker for the machine. Whenever the MOS needs information from the roms, or has information that the roms may need, it communicates with them by a service call which goes to each rom in turn.

All requests for rom services come via the MOS. They can come as a result of normal housekeeping duties, or from number of secondary sources. A simple representation is shown in Figure I. For instance, other roms can issue service calls to claim the use of particular areas of the computer's memory, or to say that they are taking control.

If some external device issues an interrupt that the MOS cannot process the interrupt information will be passed to the sideways roms to give them a chance to deal with it.

If you send a command to the MOS that it doesn't recognise, say by typing a star command in at the keyboard or calling the MOS command line interpreter from a machine code program, it is passed to each in turn. When faced with a situation it can't deal with, the MOS turns to the sideways roms for help before it admits defeat.

The only rom in the BBC Micro that does not respond to service calls is Basic. So whatever you write, be it a small utility rom or a complex language, if it doesn't respond to service calls it will not work.

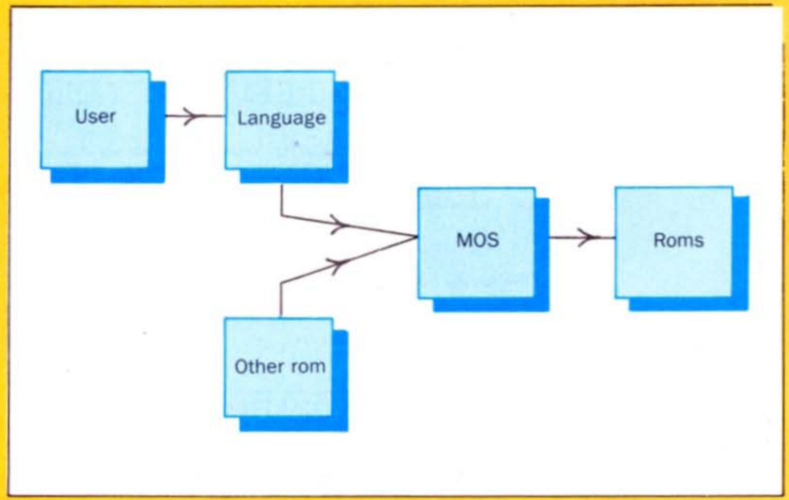

Figure I: Service call routes

The processing of all service calls begins at a single point in your rom, the service call entry address. The call arrives in the form of a machine code jump to this point, with the internal registers of the 6502 processor set to indicate the call type:

Register	Contents
A	*Rom service call code*
X	*Current rom socket number*
Y	*Any service call parameter*

If you want to produce a program for use in a sideways rom it must contain machine code capable of receiving the service calls and comparing the value of the A register with the calls that it needs to respond to.

The action a rom takes in response to a call depends largely on the rom's specific task. It should check whether it wishes to react to the call and respond accordingly. If it isn't its problem then it should hand it back to the MOS immediately with an RTS statement, preserving the registers.

As it is unlikely to be interested in more than 10 or 15 of the 256 possible calls, it should deal with those of importance, returning the rest.

In general all roms should respond to call numbers 3, 4 and 9 (see panel for details of the major calls). Call 3 is issued when the computer is switched on or reset by pressing the Break key. It allows your rom to start up, unless a higher priority rom (a rom in a higher numbered socket) has beaten it to it.

Possibly the most important system call is call 4, which offers unknown commands to the roms. If a command is sent to the MOS that it does not understand the command is offered to each rom in turn, in the hope that one will understand it.

The rom should check the command for any of the keywords it recognises, and respond to them. But if it is a filing system it must not react if it is not currently active and it must not respond to intrinsic commands (see Command Clashes in the March 1987 issue of *The Micro User*).

A full description of filing systems and their operation can be found in the Advanced User Guide or the Master Reference Manuals.

Call 9 is mainly cosmetic, but provides responses to the *HELP command. This call, like all star commands, is sent to the MOS, which processes it. The MOS then sends a service call 9 to the roms. It is this call that prompts the computer's roms to print the information that appears on the screen.

If only *HELP has been typed your rom should print its name, followed by any keywords that will give further data.

But one or more keywords may also have been typed after *HELP to request further data on one rom (for example *HELP ADFS).

While responding to a service request your rom can issue further calls of its own by executing an osbyte &8F. The X register should contain the call code while the Y register contains any parameter required.

When you have finished with the call you return to the MOS with an RTS statement.

If you wish to allow other roms to have a crack at the same call – which you should for call 9 at least – you should return with all registers containing the values they held when the request was received.

However, if you wish to prevent lower priority roms from responding you should claim the call by zeroing the accumulator when you return.

Once again, whether a rom claims the call it receives depends on the task the rom fulfils. Some calls, however, should not normally be claimed by any rom. These are indicated in the call summary.

The majority of rom service calls received by your rom won't concern it at all. It should return them immediately using a machine code RTS statement. All the processor registers should be preserved.

When you are deciding which calls you should respond to, the best rule is that if you don't understand the meaning of a call you don't need to worry about it.

The majority of rom service calls are concerned with the operation of filing systems. Any program that manipulates information stored in files, and is capable of dealing with the standard BBC file handling command, is classed as a filing system.

Note that this type of rom does not take full control of the computer in the way a language would, but deals with the command that it has been sent and then returns control to the MOS.

Most filing systems, and some other roms, need to reserve memory for their own use, and they do this using system calls 1 and 2.

On the BBC Micro each filing system takes what it needs from the user's memory, which reduces the amount available for programs and information.

On the Master this has been avoided by the introduction of a separate area of filing system ram, and calls 21 to 24 have been created to deal with it. Any filing system which is to be used on the Master should use this memory and ignore calls 1 and 2.

In general, most self-supporting roms, such as utilities, need concern themselves mainly with calls 4, 7 and 8 to check when they are selected, and call 9 to inform the user of their presence.

Designing sideways roms which behave correctly is quite a hard task, but very satisfying when you finally get one running. And you can see examples of roms which use the various routines in this issue.

The main rom service calls

&00 No operation. Means that a higher priority rom has already dealt with it and claimed it. Your rom should return it immediately.

&01 State absolute workspace requirements. Issued whenever a hard reset occurs, Control+Break or switch on. Absolute workspace is used by the current filing system, and is located from &E00 upwards.

Register Y contains the current top page of the workspace, and you should increment this value if you want more space than is currently provided.

Before using this memory you must issue a service call &0A. If you own a Master you should try to claim all your memory from the filing system ram.

Do not claim this call.

&02 Claim private workspace. Issued after the absolute workspace call, and similar in operation. The vital difference is that your rom can reserve memory exclusively for it's own use.

On entry the Y register contains the number of the first page available, and if you want some private workspace you store this value in the private workspace table and increment Y by the number of pages you want.

The private workspace table is located at &DF0 + (your rom number). The rom number is given in the X register on entry and can also be found at address &F4.

You shouldn't claim this call.

&03 Initialise on break. Allows the highest priority rom that requires it the chance to install itself as the current filing system.

Before your rom starts its initialisation routine it should check on the keyboard. Normally a filing system should only install itself if no key has been pressed, or if its selection key is pressed (for example holding down D-Break will install the disc filing system).

If the contents of the Y register is zero and your rom can auto-boot files, it should do so on initialisation. If your rom does install itself, it should claim the call before returning.

&04 Offer an unrecognised command. The MOS has received a command that it cannot deal with and it is offering it to each rom in turn.

The command is found at (&F2),Y and is an Ascii string terminated by a return, &0D. After the call has been offered to each rom in turn it is given to the current filing systm, so if your rom has already responded to the command it should claim the call before returning.

&07 Offer unrecognised osbyte. The MOS has received an undefined osbyte call and it is offering the sideways roms the chance to provide a response. The MOS saves the contents of the A,X and Y registers at &EF, &F0 and &F1 respectively.

Claim this call if you want to.

&08 Offer unrecognised osword. This call functions in the same way as the undefined osbyte call. Osword 7 calls (to make a sound) will generate this system call if they are given an unknown channel. Also, any osword above &E0 will be automatically sent to the user vector at &200 and not to the roms.

&09 *HELP command received. A *HELP command has been issued. The rest of the command line is stored at (&F2),Y in the form of a Ascii string terminated by &0D.

If this string is empty your rom should print its name and any keywords used to provide further information, then return without claiming the call.

However, if the string contains further commands the rom should check these against its keywords. If a command is not relevant to that rom then it should return without taking any action. Otherwise, it should provide the information requested but not claim the call.

&0A Claim absolute workspace. Issued by a filing system wishing to claim the absolute workspace for its own use.

If on receiving the call your rom is currently using this memory, it should

Turn to Page 130 ►

Main rom service calls continued

◀ *From Page 129*

save any important data in its private workspace and deactivate itself.

&11 Font explosion or implosion. This call is sent by the MOS to warn that a font explosion or implosion caused by an *FX20 is about to take place.

This will change the PAGE setting in Basic, so your rom should get its data out of the way or it will lose it. Notice that since Basic does not respond to service calls, it will always lose the current program when a font explosion occurs.

On Master series machines the font is stored in an area of private ram and this call is redundant.

Don't claim this call.

&12 Initialise filing system. A program that is using more than one filing system will often wish to install a filing system quickly, without issuing the normal MOS commands, such as *TAPE.

The system installed should use the files that it had open when it was closed down (by service call &0A). On entry the Y register contains the filing system number which is not the same as the rom number.

&21 State absolute workspace requirements in filing system ram. This call is for the Master only and is the equivalent to call &01 in earlier machines. The memory being allocated is found between &C000 and &DC00 and should be used in preference to claiming the user ram offered by call &01.

You should not claim this call.

&22 Claim private workspace in filing system ram. The equivalent of call &02 but reserves private workspace in the Master series filing system ram. The top of workspace is &DC00.

Do not claim the call.

&27 Inform of Reset. A soft break has occurred on the Master series computer so all roms should re-initialise themselves.

Do not claim the call.

&28 Offer unrecognised CONFIGURE command. Allows roms to make use of the battery-backed CMOS ram on the Master. An unrecognised CONFIGURE command has been received and is being offered to the roms. It is similar in use to call &04.

Any rom which uses the CMOS ram on the Master can use this call to alter its start-up configuration. If it recognised the command it may claim the call.

&29 Offer unrecognised STATUS command. An unrecognised STATUS command has been received and is being offered to the roms. It is similar in use to call &04. Any rom which uses the CMOS ram on the Mater can use this call to display its start-up configuration. It may then claim the call.

&2A Imminent language change. Informs all roms on a Master that the current language is about to change.

You should not claim the call.

&FE Tube system post-initialisation. This call is issued after the high-water mark (PAGE) has been set up and is for the use of the tube system. If your machine does not use the tube it may find another use for this call.

&FF Tube system main initialisation. This call is only issued if a tube system has been detected. It is sent just before the start-up message is printed. ■

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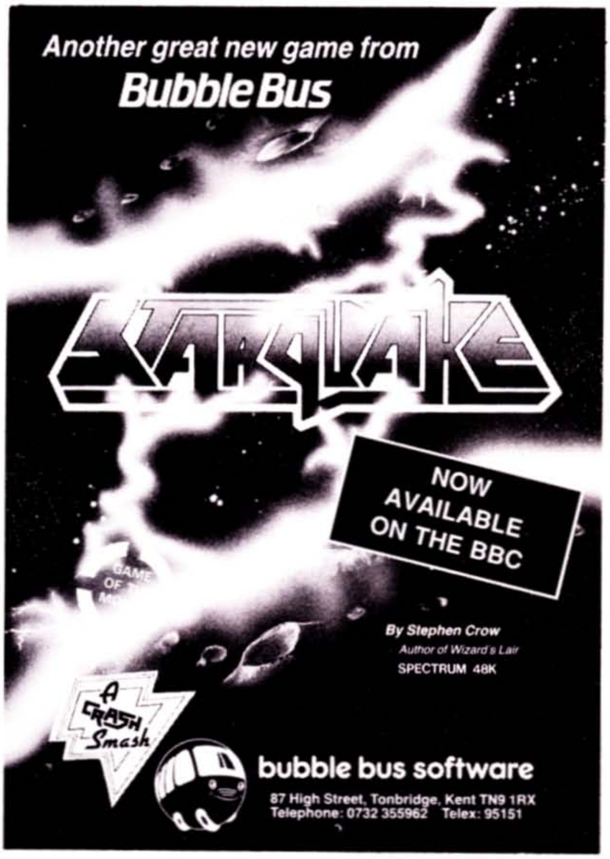

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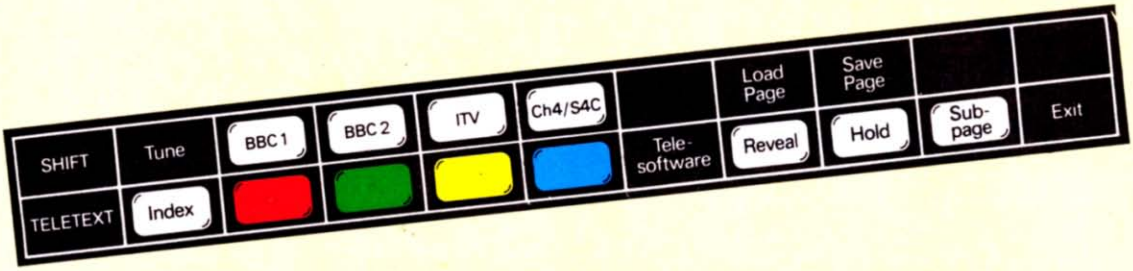

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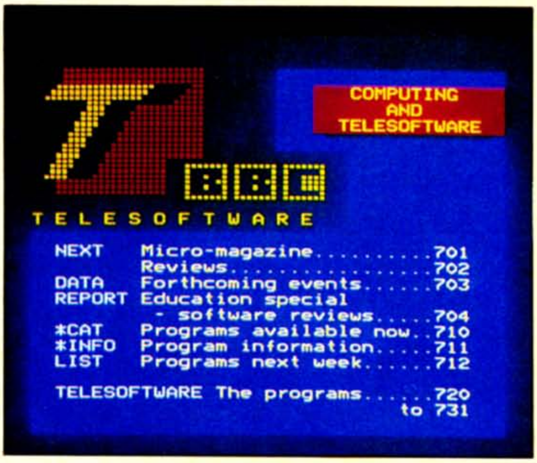

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They emphasise that these problems only affect a few areas of the country. However, if you have any doubts as to the quality of signal available in your area you should contact the BBC Technical Support Service on 01-927 5040.

TO ORDER TURN TO THE FORM ON PAGE 167

CEEFAX Guide

```
P298  CEEFAX 797  Fri 20 Mar  11:34/53
                                  1/36
          YOU ARE WATCHING
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               CEEFAX
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 hundred pages and is available to
 anyone with a suitably-equipped
 television set.
```

June 5 to 11

Program	*Description*
SRDBase	Create your own database with this software designed for sideways ram. A main memory version is also provided for those without SWR facilities. Ideal software for small clubs and societies, or any situation where lists are kept.
Recipes **R/Info**	Keep selected Ceefax recipes together in one "book". These programs automatically examine the Ceefax recipe pages, offering the chance to add the current recipe to your store. Over 150 recipes can be stored in one file and individually studied at any time. Printed copies of any recipe can be easily produced.
CEE/VID **CEEINFO**	A utility program for VidiEditor (transmitted last month). Compile a VidiEd type magazine from any set of Ceefax subpages. Just type in a Ceefax page number and all the subpages on that page will be found and stored in a single magazine. VidiEd then allows printing, editing or display of any desired sub-page. Frames can be added to your own carousel for an automated rolling display.
T/OSB21 **B/OSB21**	Part 21 of our BBC assembler and machine code guide. This course leads you through the workings of the inbuilt BBC Micro 6502 assembler in a series of around 26 parts.
COMPRCS	A routine to compress long messages into a small amount of memory. A versatile and useful routine making adventure programs, software instructions and any program displaying messages, more efficient. (*The Micro User*, October 1986)
SecEn26	Teachers' notes to accompany the BBC Educational TV and radio programmes: Secondary English: 11-14
Scene26	Scene
'A'Bio6	Advanced Level Studies: Biology
'A'His6	Advanced Level Studies: History

Software is currently transmitted for a period of one week. Downloading can take place from Friday evening to the following Thursday evening. As the updating takes place on a Friday, we do not advise attempting to download software between 9am and 7pm on Fridays. The program details given are provisional.

June 12 to 18

Program	*Description*
Anagram	Analyse any text to give all available anagrams. This invaluable technique can be applied to many applications including crossword puzzle solving!
Keyword	Teletext is a valuable and interesting magazine. To find any specific information normally involves typing in the relevant page number. Keyword lets you type in any word or phrase. The computer then silently and efficiently searches the Ceefax or Oracle transmissions and displays every page containing your reference. You no longer need to consult the teletext index. (For use only with the Acorn adapter).
T/OSB22 **B/OSB22**	Continuation of our course guiding you through the intricacies of machine code programming.
Salaman **TobGame**	Intriguing games based on the famous battles of Tobruk and Salamander. Can you make the right strategic decisions as you lead your troops into battle?
T/ATSOB **B/ATSOB**	Part B of our series showing how to extract information from Ceefax transmissions looks at the *Page Update Bit* – a code transmitted with every Ceefax page. Using this, it is easy to tell whether the page received is the same as the last transmission, or if it has been altered or replaced since its last broadcast.

Turn to Page 134 ▶

NEXT and EDITORIAL FEATURES DURING JUNE

In Paper Round Keith Hazelton begins a two-part feature on how a major micro magazine is produced – with a visit to the The Micro User offices.

Richard Hewison extends another helping hand to struggling adventurers and begins a series of hints on playing Level 9 games.

Outsider turns his attention from Prestel to a new force in the videotex world: Timefame Epnitex.

Miles Potwell begins a series of articles on the electronic mail alternative, Telecom Gold.

Plus news from the computer world, answers to viewers' computing problems and reviews of the latest software.

Next is a year old this month. Watch out for the celebratory competition: lots of prizes.

Next news and features are on BBC2 701, reviews on BBC2 702. Both are updated every Saturday.

If the much-vaunted June General Election really does come about, there's only one way to keep up with it – by Ceefax. During the campaign there will be a daily election briefing section starting on page 100 on BBC2; on election night results from all 650 constituencies will be supplemented with the latest State of the Parties information, computer predictions and politicians' reactions.

Also in June – and this time it's definite – the Ceefax sports team will be out and about with their micros, inputing directly to the Ceefax computer as outlined in last month's Micro User. Direct practice and race reports from the exciting Isle of Man TT races begin the month, and at the end there will be full facts and figures from every court at Wimbledon.

Yes – another great month on Ceefax.

◄ From Page 133

AutoRun	Add flexibility to your programming skills with this routine to *RUN Basic programs. (*The Micro User*, October 1986)
SecEn27	Teachers' notes to accompany the BBC Educational TV and radio programmes. Secondary English: 11-14
Scene27	Scene
'A'Bio7	Advanced Level Studies: Biology
'A'His7	Advanced Level Studies: History

June 19 to 25

Program	***Description***
TexBase **BTBinfo**	Many programs require text to be entered as DATA statements. The Basic interpreter does not, however, include any word processing facilities. TexBas allows you to prepare text using any word processor (or any other method), then append the finished text to a BASIC file as DATA to be used as normal with the READ statement.
Token6	Some computers allow Basic keywords to be entered using a single keystroke. Token6 offers this facility on the BBC Micro.
T/OSB23 **T/OSB23**	OSBITS machine code programming series – part 23.
Index 1 **Index 4**	Compile a full printed Ceefax and Oracle index. These programs will scan the Ceefax transmissions and print the entire index in a neat, easy-to-use format.
PDR **Documen**	A versatile and very fast two-colour screen-to-printer dump routine. Print out any two-colour screen display using an Epson compatible printer. This routine works fast enough to be of great value to Econet users as well as non-network machines.
FKeys	A routine allowing you access to 16 function keys while still retaining full cursor editing. (*The Micro User*, January 1987)
SecEn28	Teachers' notes to accompany the BBC Educational TV and radio programmes: Secondary English : 11-14
Scene 28	Scene
'A'Bio8	Advanced Level Studies: Biology
'A'His8	Advanced Level Studies: History

June 26 to July 2

Program	***Description***
ETFS **Manual**	Use Teletext across an Econet network. This software makes the broadcast Teletext services available to any station on the network. A single adapter can now to serve the entire system.
T/OSB24 **B/OSB24**	Continuing our series for beginners in Assembly language programming.
T/ATS09 **B/ARS09**	Using these routines, it is easy to discover a lot of useful information about any particular Ceefax page. Teletext receivers can be told not to display a particular page, or not to display the header row. They must also respond slightly differently if the page is a news-flash or a subtitle.
Shadows	Educational package simulating experiments with shadows – a topic that can cause some problems at home and school because of the need for a darkened room and a controllable light source. (*The Micro User*, November 1986)
SecEn29	Teachers' notes to accompany the BBC Educational TV and radio programmes: Secondary English : 11-14
Scene 29	Scene
'A'Bio9	Advanced Level Studies: Biology
'A'His9	Advanced Level Studies: History

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BBC Micro roms directory

Rom	Maker	Price	Size	Compatibility	Description	Hardware required
ASSEMBLERS AND DISASSEMBLERS						
AD86	SS	29.95	16k	All	Assembler/Disassembler (disc based) for 6502/65C02	Word processor
ADE+	SY	46.00	32k	All	Complete assembler development system available as rom image	32k s/way ram useful
Beebmon	WE	22.00	8k	B	Advanced machine code monitor/disassembler	None
Exmon II	BB	32.00	8k	B	Machine code debugging tool with dual screens	None
Macrom	CS	40.00	16k	All	6502/65C02 macro assembler with editor	Disc drive
Ramrod	CS	40.00	16k	All	Complete ram/rom (Tube) ADFS/DFS toolkit and disassembler	None
Romas	WE	29.00	16k	B	Sophisticated cross-assembler and editor for various processors	None
StarMon	SL	19.95	8k	All	Comprehensive machine code utility	None
CAD AND GRAPHICS						
AMX Mouse	AX	79.95	16k	All	With disc includes mouse operating system and WIMPs control	None
AMX Design	AX	69.95	32k	All	Sophisticated CAD package from PCBs to architecture. Includes disc.	None
AMX Pagemaker	AX	49.95	2 16k	All	Full desk top publishing environment. Includes two discs.	None
Graphics Rom	CC	29.00	8k	B	Extends graphics commands, includes sprites, "turtle" and 3D plotting	None
GXR	AC	21.00	16k	B	Extends PLOT commands, includes sprites, block moves and flood fill	None
GXR	AC	22.00	16k	B+	Extends PLOT commands, includes sprites, block moves and flood fill	None
Instant Mini Office	DB	59.95	128k	All	Easily create bar/pie charts and line graphs. (Part of comprehensive package.)	None
Interchart	CC	36.80	16k	Not 2P	Intergrated chart and graph plotting using Rom Link	None
Novacad	TL	79.00	16k disc	Not C	Computer aided draughting package	Disc drive, Printer
PCB	PS	97.75	16k	Not 2P	Produces double sided PCB artwork on printer	Disc drive, Epson
Quest Mouse	WE	59.00	32k disc & mouse	All	Ultimate in mouse technology, full drawing features plus much more	None
StarGraph	SL	21.95	8k	B B+	Graphics extension – circles, ellipses, polygons, text, skewed or scaled.	None
COMMUNICATIONS						
CommSoft	SM	–	16k	All	Integrated viewdata & Ascii terminal including Xmodem	Modem
CommStar II	PM	34.00	16k	All	Comms rom accessing Email and Prestel-like services	Modem
Command	BB	39.00	16k	All	Command driven full feature communications package	Modem
Instant Mini Office	DB	59.95	128k	All	Easy access for uploading and downloading. (Part of comprehensive package.)	Modem
Termi II	CC	25.00	16k	B B+	Easy to use terminal emulation for connection to remote computers	Modem
DATABASES						
CardFile	GS	12.65	16k	All	Flexible card file system with tag fields and multiple files	None
Instant Mini Office	DB	59.95	128k	All	Disc-limited capacity, fast access, easy to use. (Part of comprehensive package.)	None
StarStore	SL	29.95	16k	All	9999 records 90 fields, 255 character field	Disc drive
System Delta	MS	64.95	16k	Not 2P	Versatile-command driven database system	None
ViewStore	AC	37.00	16k	All	Powerful general purpose database with flexible screen formats	None
FILING SYSTEMS						
Adv DFS BBC	AP	34.50	16k	B B+	Uprated 1770 DFS with double density 62 files ram disc	1770 s/way ram
Adv DFS Master	AP	34.50	16k	M C	Uprated 1770 DFS with double density 62 files ram disc	None
DFS	WE	16.00	16k	B	Sophisticated alternative to the Acorn DFS	8271 disc interface
DDFS	WE	46.00	16k	B	Double density DFS with 8271 emulation for compatibility	Price is complete kit
MAX	AX	19.95	16k	All	Easy to use graphic front end for disc file management	None
RomIt	BB	34.00	16k	B B+	Provides a ram filing system and printer buffer	Sideways ram
LANGUAGES						
BCPL	AC	42.00	16k	All	Easy-to-learn flexible structured language, for writing utilities	None
Comal	AC	36.00	16k	All	General purpose structured language similar to Basic	None
Forth	AC	32.00	16k	All	To 1979 standard, very fast semi-compiled language	None
Iso-Pascal	AC	42.00	32k	All	Full implementation, plus extensions for BBC Micro special facilities	None
Lisp	AC	35.00	16k	All	Fundamental language of artificial intelligence, with special extensions	None
Logo	AC	42.00	2 16k	All	Implementation of standard Logo, with multiple screen graphics	None
Logo	LL	60.00	16k	All	Standard Logo - fast, comprehensive, modular and extensible	None
MasterLogo	LS	40.50	16k	All	Full Logo (also supplied as rom image on disc)	None
Micro-Prolog	AC	62.00	16k	All	Fifth generation relational database language for expert systems	None
Open Logo	BC	69.95	2 16k	All	Full implementation, 120pp tutorial and 320pp reference manual	None
MISCELLANEOUS UTILITIES						
Dump-master II	BB	31.00	16k	All	Multi-printer screen dump	Printer
Dumpout3	WE	25.00	16k	All	Dump any graphics screen to printer and colour shading	Specified printers
Help II	BB	31.00	16k	All	Data on BBC Micro system available at your fingertips	None
Icon Master	BB	34.00	16k	All	Generates code to use icons in Basic programs	None

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Rom	Maker	Price	Size	Compatibility	Description	Hardware required
Instant Mini Office	DB	59.95	128k	All	Label printer using database information. (Part of comprehensive package.)	None
Master Replay	VM	39.95	16k	M	Tape to disc transfer system	Overlay rom board
Master Replay	VM	41.95	16k	M	Tape-to-disc transfer system (self-contained)	None
Mega Rom	CH	29.95	16k	All	67 commands, Basic toolkit, rom manager, disc utilities	None
Replay	VM	35.00	8k	B B+	Tape to disc transfer system	Hardware provided
Security	SS	9.95	8k	All	Locks out unauthorised user from machine	None
Speech Rom	CC	24.00	8k	B B+	Produces infinite vocabulary speech output from phonemes	Acorn speech unit, TMS5220
TED	WE	35.00	32k	All	Advanced teletext screen editor and display	Colour preferred
View Printer Driver	WE	33.00	32k	All	Sophisticated printer driver generator for View	None
SPREADSHEETS						
Instant Mini Office	DB	59.95	128k	All	40/80 column 3000 cells plus many maths functions	None
Intersheet	CC	56.35	32k	All	Spreadsheet using rom link plus output for any word processor	None
Ultracalc2	BC	52.00	16k	All	All screen mode, simple command language with lookup facilities	None
ViewSheet	AC	37.00	16k	All	Full facility spreadsheet with features for easy row/column reference	None
DISC UTILITIES						
Advanced Disc Investigator	AP	28.75	16k	All	Powerful tool for standard and non standard discs	Disc drive
Advanced Disc Toolkit	AP	34.50	16k	All	34 general purpose commands for all Acorn disc systems	Disc drive
ADU	PS	33.35	16k	All	Essential utilities for ADFS (including Winchester)	ADFS
BROM+	CS	34.50	16k	All	Basic program editor plus DFS & memory editor	None
Disc Doctor	CC	28.00	8k	B	General purpose disc utility kit, plus some ram functions	8271 interface
Floppywise Master	SS	29.95	16k	M	Disc/machine utility toolkit	None
Floppywise Plus	SS	29.95	16k	B	Disc/machine utility toolkit (40 commands)	None
Ramrod	CS	40.00	16k	All	Complete ram/rom (Tube) ADFS/DFS toolkit and disassembler	None
ROM/RAM UTILITIES AND TOOLKITS						
Adv Rom Manager	AP	14.95	8k	All	Versatile utility for users of sideways ram/rom	None
Beebman	SL	14.95	8k	All	Comprehensive rom/ram manager	None

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BROM+	CS	34.50	16k	All	Basic program editor plus DFS & memory editor	None
Disc Doctor	CC	28.00	8k	B	General purpose disc utility kit, plus some ram functions	8271 interface
Floppywise Master	SS	29.95	16k	M	Disc/machine utility toolkit	None
Floppywise Plus	SS	29.95	16k	B	Disc/Machine Utility Toolkit (40 commands)	None
Ramrod	CS	40.00	16k	All	Complete ram/rom (Tube) ADFS/DFS toolkit and disassembler	None
Rom Manager	WE	20.00	8k	All	Provides control over roms to avoid software clashes	None
Rom Master	CH	14.95	8k	B B+	Over 20 commands to control roms, plus password file encryption	None
BASIC UTILITIES AND TOOLKITS						
Accelerator	CC	48.00	16k 8k	B	Basic compiler to intermediate G-code or full machine code	None
Addcomm	VM	28.00	8k	B B+	Adds 40 new Basic commands graphics and toolkit	None
Basic Editor	AC	29.00	16k	All	Full-screen Basic program editor with word processor facilities	None.
Basic Extensions	MP	19.95	16k	B not 2P	Adds many new commands and structures to Basic	None
BROM+	CS	34.50	16k	All	Basic program editor plus DFS & memory editor	None
Caretaker	CC	25.00	8k	B not 2P	Adds 17 commands to aid writing and debugging Basic programs	None
Matrix	VM	41.40	16k	B B+	Provides matrix manipulation commands for Basic programs	None
Multi-Basic	CM	39.95	16k	B B+ M	Fully multi-tasking BBC Basic with 50 new commands	None
Sleuth	BB	32.00	16k	B not 2P	Basic debugging utility	None
Toolkit Plus	BB	39.00	16k	B B+	Utilities for the Basic program development	None
WORD PROCESSORS AND EXTENSIONS						
Edword2	CT	45.95	8k	–	Easy to use, high educational value, comprehensive documentation.	None
Dotprint Plus	TL	28.00	16k	Not C	NLQ character generator and Word processor printer utility	Epson-compatible Printer
Epson NLQ Rom	WE	25.00	16k	B 2P	Gives Epson RX/FX printers NLQ typeface	Epson-compatible printer
Instant Mini Office	DB	59.95	128k	All	20/40/80 columns, full facility, easy to use. (Part of comprehensive package.)	None
Interword	CC	56.35	32k	Not 2P	Integrated WYSIWYG 40-106 column word processor using Rom Link	None
NLQ Designer	WE	25.00	16k	All	Design NLQ fonts and download to printer	KAGA KP810 with 8k ram
PenDown	LL	39.00	16k	Not 2P	Child-centred word processor with powerful disc extensions	None
Rom Spell	WE	25.00	16k	B	Spell checks any Ascii file using 30000 word dictionary	None
Spellcheck III	BB	36.00	16k	Not C	Automatic checker for word processor documents. With user dictionaries	None
Spellmaster	CC	59.00	128k	Not 2P	Very fast spelling checker 58500 rom dictionary ram user dictionaries	None
StarWord	SL	34.50	16k	All	Comprehensive professional word processor with mail merge facilities	None
View 2.1	AC	37.00	16k	B	High quality professional word processor with advanced facilities	None
View 3.0	AC	54.00	16k	B+	Specially designed for B+ with more advanced facilities	None
ViewSpell	AC	29.00	8k & disc	All	Spelling checker for View 70000 word dictionary	View
WordEase	BB	39.00	16k	All	Extends features available in Wordwise Plus	Wordwise Plus
Wordwise Plus	CC	56.35	16k	All	Word processor with text-based programming language	None
Word Aid	WE	24.00	16k	Not 2P	Adds features to Wordwise Plus exploiting programming language	WW+ & disc drive
Wysiwyg Plus	TL	21.00	16k	All	Word processor/Basic screen and printer utility	Printer

Manufacturers Codes

AC: Acornsoft
Unit 8, Cambridge Technopark,
645 Newmarket Road, Cambridge
CB5 8PD. 0223 214411

AP: Advanced Computer Products Ltd
6 Ava House, High Street,
Chobham, Surrey. 0276 76545

AX: Advanced Memory Systems Ltd
166/170 Wilderspool Causeway,
Warrington, WA4 6QA.
0925 413501

BB: Beebug
Dolphin Place, Holywell Hill,
St.Albans, Herts, AL1 1EX.
0727 40303

BC: BBC Publications
British Broadcasting Corporation,
35 Marylebone High Street,
London, W1M 4AA. 01 580 5577

CC: Computer Concepts
Gaddesden Place, Hemel
Hempstead, Herts, HP2 6EX.
0442 63933

CH: Chalice Software
3 Merlin Way, Covingham,
Swindon, SN3 5AN. 0793 615026

CM: Cambridge Microprocessor
Systems Ltd, Brookfield Business
Centre, Twentypence Road,
Cotterham, Cambridge, CB4 4PS.
0954 51122

CS: Clares Micro Supplies
98 Middlewich Road, Northwich,
Cheshire, CW9 7DA. 0606 48511

CT: Clwyd Technics
Unit 4B, Antelope Industrial Estate,
Rhydymwyn, Nr Mold, Clwyd, CH7
5JH. 0352 83751

DB: Database Software,
Europa House, 68 Chester Road,
Hazel Grove, Stockport, SK7 5NY.
061 429 7931

GS: Gensoft
1 Scarisbrick Road, Burnage,
Manchester, M19 2BT.

LL: Logotron Ltd
Dales Brewery, Gwydir Street,
Cambridge, CB1 2LJ.
0223 323656

LS: Logo Software Ltd
316a Richmond Road,
Twickenham, Middlesex, TW1 2PD.
01 891 0989

MP: Micro Power
Northwood House, North Street,
Leeds, LS7 2AA. 0532 458800

MS: Minerva Systems
69 Sidwell Street, Exeter, Devon.
0392 37756

PM: Pace Micro Technology
Allerton Road, Bradford, BD15
7AG. 0274 488211

PS: Pineapple Software
39 Brownlea Gardens, Seven
Kings, Ilford, Essex, IG3 9NL.
01 599 1476

SL: Slogger Ltd
107 Richmond Road, Gillingham,
Kent, ME7 1LX. 0634 52303

SM: Soft Machinery
68 Botley Road, Oxford, OX2 0BU.
0865 726803

SS: Software Services
65 South Mossley Hill Road,
Allerton, Liverpool, L19 9BG.
051 427 7894

SY: System
12 Collegiate Crescent, Sheffield.
0742 682321

TL: Technomatic Ltd
13-17 Burnley Road, London,
NW10 1ED. 01 208 1177

VM: Vine Micros
Marshborough, Sandwich, Kent,
CT13 0PG. 0304 812276

WE: Watford Electronics
Jessa House, 250 High Street,
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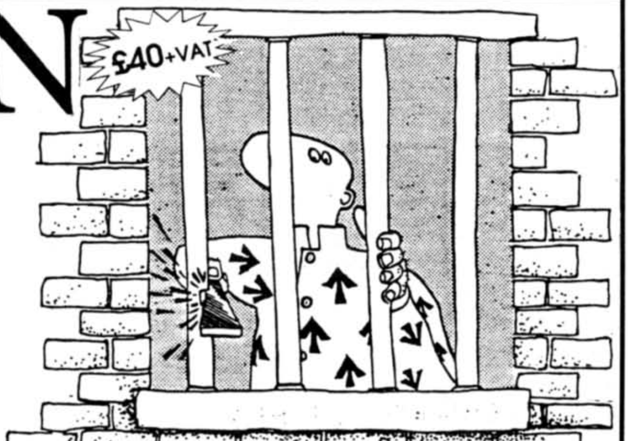

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- Viglen Disc Drive Single Sided 40/80T + PSU £80 o.n.o. Tel: 01 555 3808 after 4pm.
- BBC B Solidisk DFS, ADFS, 128K Sideways RAM. All manuals. Elite, Other Software. Tel: Stevenage (0438) 722901 (Evenings) £300
- BBC B, SWR Board, Books, Mags, Replay, Wordaid, Fontwise+, Music System, Mini Office II and many more. Free Software With Orders. Tel: Frank Erith 30179 For Prices.
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- Master 128 + Turbo, Manuals, Software, RGB Medium REsolution Monitor. Twin 400K Double Sided Drives With PSU. Acorn Z80 with software. £900. (0604) 413552 Evenings.
- Acorn Prestel Adaptor With ROM V.G.C. £75 o.n.o. Tel: 0858 62985 after 3pm.
- Sideways RAM 16K, Includes R/W - Switch, Twenty Utilities, £12.50. Send Cheques/Enquiries: G.J. Eida, 14 Hurstwood Avenue, Bexley, Kent.
- Taxan KP910 Epson Compatible NLQ Printer Wide Carriage, 8KB Buffer, Cable, As New Cost £390 Accept £275. Tel: 061 434 6251 Evenings.
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- WANTED - Someone To Teach Small Music Business Management Co. To Use BBC Master-Series For Basic Functions I.E. E-Mail, Telex, WP/ Printer, Simple Data-Base etc. A Few Days' All That's Needed. Office In Chiswick W4 - Can You Help? Tel: 01 994 7556.
- WANTED Master 128 Price To Be Negotiated. Tel: 051 486 6766.
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- WANTED Aries B12 Plus B32 Or HCR External Rom / Ram. Tel: 0276 22249.
- Watford Solderless Sideways Rom Board Eleven Sockets Plus 16K Ram, Read / Write Switches And Software £28. Also Watford 16K Sideways Ram Battery Backup, Switch And Software £26. Tel: Emsworth (0243) 376726.
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- Eighty Repton 3 Screens £5 Inc P+P. Please Specify Tape / Disc (40/80). Send To N J Pedley, 44 Tintern Road, Perry Barr, Birmingham, B20 3HJ.
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CJE micro's

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in user definable Fonts.

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Simple to use, standard EPSON codes for Underline and Doublewidth used.

After initialising Multi-Font NLQ with a '*MFNLQ', Multi-Font NLQ is normally transparent to the user. Multi-Font does claim some memory for workspace and storing font data.
Multi-Font NLQ comprises of MFNLQ ROM for the BBC, and utility disc containing the FONT definer, ten fonts, BASIC demonstration program, VIEW demo text file and Driver.
Multi-Font NLQ is compatible with nearly all software, including most BASIC programs, VIEW, WORDWISE & InterWORD (SCRIBE & Printer Buffer software currently not supported).

Ten fonts are supplied or create your own using the font definer supplied.

Fonts included are:-
Standard NLQ, Courier, Italic, Gothic, CompTS, Bold, Shadow, Outline, Broadway E, Theatre

Additional Font Disc MF 'B' contains:-
Hand, Script, Stencil, Broadway, Caps, Italic-Plain, Meccano, Plain, STD large, Wire, Greek/Maths and Inverse.

For Canon & Taxan Kaga users we recommend FONTAID in preference to Multi-Font NLQ.

Multi-Font NLQ (ROM and 40/80 Disc)	**£30.00**
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NEW

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Two switches set to RAM slots to be:-
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This is GOTHIC
This is COMPTS
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This is OUTLINE
This is BROADWAY
This is THEATRE

EXAMPLE OF MFNLQ FONTS

FONTAID

ENHANCED!

NLQ Definer for Canon & Taxan Kaga NLQ Printers.

Design your own NLQ Fonts or 'download' one of our 40+ predefined fonts.

Fonts can be downloaded within Wordwise, Inter Word or VIEW Documents allowing different fonts to be used for different paragraphs, or even individual lines of text. During downloading your Program or Text will not be corrupted.

On the FONTAID standard font Disk are the following eight fonts:- Square, Outline, Italic, Gothic, Computer Type Style, Bold, Shadow, and Broadway Engraved.

Additional disc 'A' gives an extra 11 fonts including:-
Greek/Maths, Plain, Hand & (Elite, Condensed, & Super Condensed).

Now included is a facility to issue * commands within a VIEW document.
To download new fonts within VIEW documents, the FONTAID ROM needs to be fitted in the BBC. (All other FONTAID facilities are available on both the FONTAID ROM & DISC). Fonts are always downloaded from Disc.

Fontaid is recommended to Canon & Taxan Kaga owners in preference to Multi-Font NLQ. As downloadable NLQ is a built-in facility of the Printer, full access to all the printers control codes is still allowed. The resolution of the FONTAID NLQ is also slightly higher than that of Multi-Font NLQ.

FONTAID requires 6264 RAM chip in printer.

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FONT ROMS of individual fonts are available eg "Square".	**£18.00**
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INFORM

A UNIQUE NEW POWERFUL USE FOR SIDEWAYS RAM

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INFORM has been developed specifically to take full advantage of the Sideways RAM facility that many BBC micro users now have. Inform is compatible with most SIDEWAYS RAM units including ATPL Sidewise with RAM, Solidisc SWR, BBC B PLUS 128K & BBC MASTER series (not SDL256)

INFORM is a very powerful facility, which allows the user to display text information, of any kind, from Sideways RAM. This information can be readily accessed by using * commands from the keyboard or from application programs. In this way, much information can be displayed on the screen without stopping the current task, such as entering text in WORDWISE or VIEW.

The information in the RAM can be changed dynamically at any time.

Some of the possible applications for INFORM are:–

An on screen help manual can be created for your application, so that a reminder about more obscure points can be displayed at the users request. Information on your program or datafile contents, can remind you of their purpose.

Address and/or telephone numbers can be held and displayed quickly even while other applications are running. Very useful if you need to quickly display information about a client while he is hanging on the end of a phone!

Current prices for your products or stock position can be recalled instantly and readily modified using a wordprocessor. Similar files may be created from most databases such as VIEWSTORE.

In fact, any information to which you frequently refer can be displayed immediately without running another program. Your use of INFORM is only limited by your imagination, as they say!
There are three Inform Data Files (I.D.F.), of often used information, supplied on the disk to give an indication of the use of INFORM.

To use INFORM you must have Sideways RAM.

INFORM on 40/80 track disc. P & P on INFORM £1.00 **£20.00**

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C.J.E. BBC Printer Packs are £15.00 cassette (£16.00 disc) (e.g. Kaga KP810 with Printer pack £260 + £15 = £275 everything included)

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CJE micro's

Be better informed . . .

Loading in some extra help sounds a good idea. Jim Notman investigates

A USEFUL feature of larger and more powerful computers than the BBC Micro is a built-in Help function. These are often files which may be examined at any time and usually include details of syntax and any special control codes for the software being used.

The BBC Micro is rather short of memory, so valuable ram cannot be used for this purpose. To get this type of information directly from a disc each time you wanted would be tedious, as you would need to insert the correct disc at the correct time.

CJE Micros has a different approach, that of putting the information into sideways ram. This may be in the extra banks of ram already fitted to the Master or B+ 128, or with sideways ram boards fitted to the Model B or B+.

The software is supplied on a single 5¼in disc, formatted for use with both 40 and 80 track drives.

Before the software can run it needs to be loaded into sideways ram and then initialised by pressing Break or Control + Break. A slightly different version is also supplied for Solidisk owners.

Typing *HELP INFO shows the extra commands which are now available (see Figure I).

The software consists of two parts: The first is the program itself, and the second is the data.

```
*HELP INFO

INFORM 1.0
  *I          Show topics
  *I (topic)  Show specific topic
  *I (top*)   Show topic with wild card
  *I ?(str)   Show any topic with (str)
  *ILOAD <fsp> (Q)  Load I.D.F.

INFORM Data Files:


INFORM USER GUIDE
```

Figure I

Inform comes supplied with information about itself, divided into sections, each of which has a topic title. These titles are displayed by typing *I, as seen in Figure II. Information about a particular topic is then displayed by typing in *I followed by the topic title.

There is some flexiblity in searching for what you want by using wildcard characters to search for a particular topic title or search through the text itself.

To save the hassle that can arise with upper and lower case characters, Inform ignores the case of letters when searching.

The reason it is so useful is that the data can be changed by you for one of the data files on the software disc, or any file you have written. These files are loaded into sideways ram with the *ILOAD command and will overwrite any data file already in memory.

```
>*I

Topics available :

   INFORM USER GUIDE
   COMPATIBILITY
   USE
   WILD CARDS
   CREATION OF HELP FILE
   STYLE OF PRESENTATION
   LENGTH OF TOPIC FILES
   APPLICATIONS
   TOPIC FILES ON DISK
   TIPS
   LIMITATIONS
   AUTHOR

Use *I <topic> for more details
```

Figure II

Three files are supplied on the software disc. PRINTCC gives many of the printer control codes for Canon, Taxan and Epson printers. BBCHELP gives information about the main FX calls, VDU, PLOT, teletext control codes and the main operating system calls. The ADDRESS file shows how data may be stored in ram in the form of a sample address file.

New data files may be written with any word processor (such as Mini Office II, Wordwise or View) as long as the file does not contain any control characters other than carriage return.

There are no complicated commands to remember: All you need to do is enter a ' in front of a topic title and press Return, then enter the associated text.

There is no need to worry about words being split between lines when displayed as Inform will take care of this for you. When you have finished preparing the file, save it on to disc, then load it into ram with the *ILOAD command.

A data file can be up to 13¾k long, so there is room for a considerable amount of text.

With the Master or B+ 128k you can place separate copies of Inform in different ram areas, allowing even more space for text storage.

The software can be tailored to include your own data file with a Basic program supplied on disc. This makes it simpler to load the information you want.

I was impressed not only by the delightful simplicity of the idea, but how easy the software is to use. There is no need for a long complicated manual – the 14 page booklet is quite adequate.

This package has an obvious market in the educational field, but could easily be configured for use by just about anybody.

The example of storing addresses shows how this may be used in small businesses, where it could be used to store any information that is required in a hurry. And Wordwise owners might think it good value just for the help it gives with the printer codes.

Product: Inform
Price: £20 (rom)
Supplier: CJE Micro, 78 Brighton Road, Worthing, W Sussex.
Tel: 0903 213361

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to micro users on *MicroLink*. With it you can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free telesoftware programs directly into your micro . . . and much more.

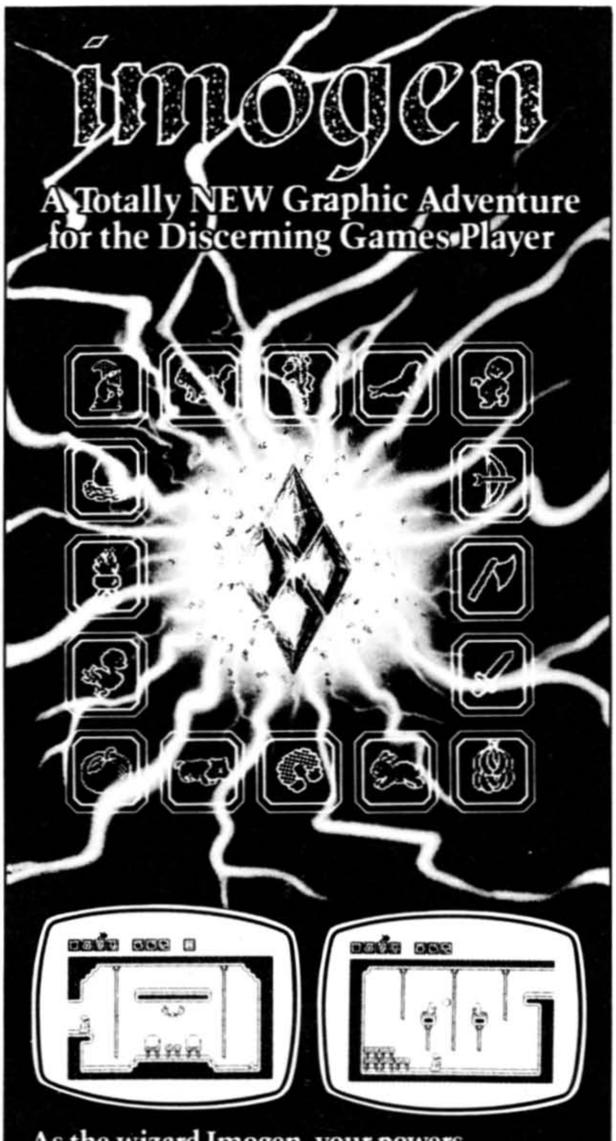
But why use Telex?

Because it's a standard means of instant communication between businesses. Today there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. They need it to dramatically speed up business communications – just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

MicroLink application form: Page 127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MICRO HELP
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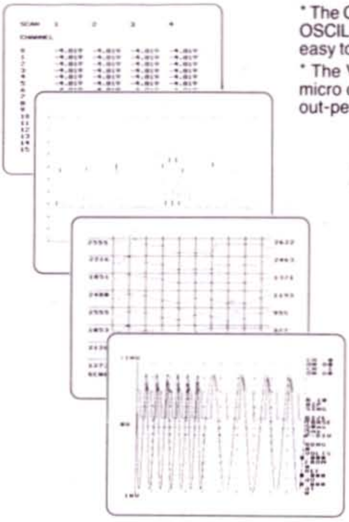

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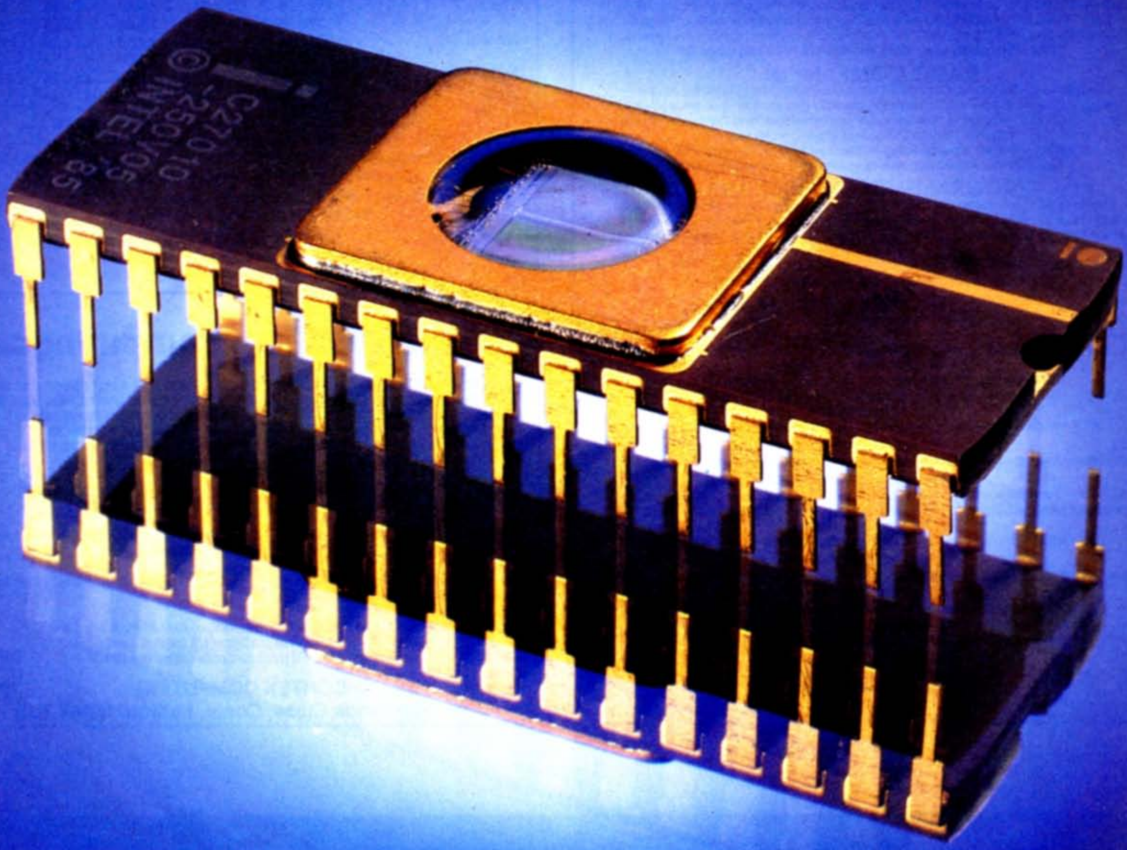

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Special switching techniques ensure that the 128K ROM appears to the machine as one single 16K ROM - this guarantees that it is completely compatible with the ROM sockets in all versions of the BBC Micro- computer.

Compatible with all the major word processors

SPELL-MASTER has been designed to fully integrate with the most popular word processors on the BBC, WORDWISE and WORDWISE PLUS, VIEW and of course INTER-WORD. While editing in these word processors all that is necessary to control SPELL-MASTER is to press one CTRL key (Usually CTRL-J). This causes a menu to appear listing a variety of options such as 'Check entire text', 'Check word at cursor', 'Continuous check - on/off' etc. Text is checked directly in memory while in the word processor. There are even short-cuts to the menu, for example, pressing CTRL-V in any of the above word processors will start checking the text immediately from the current cursor position. Compare this with the process of checking text in the most highly rated competitive product - VIEWSPELL.

VIEWSPELL	SPELL-MASTER
•Save text from word processor. •Enter spelling checker. •Load text into spelling checker. •Check the text. •Go back to word processor. •Load marked text.	•Press CTRL-V
•...finally, make corrections.	• make corrections.

Check entire text

In a word processor, SPELL-MASTER can check at up to 10,000 words per minute. Whenever a word is indicated as misspelt the user is given three simple choices. Replace the word with another selected from the dictionary, ignore the word altogether or add it to a user dictionary.

Check as you type

Because the dictionary is ROM based it is possible to check words as they are typed. This feature works with all the above named word processors and does not slow the operation of the word processor at all. Whenever an incorrect word is entered the computer will bleep; the word may then be corrected or simply ignored.

User Dictionaries

SPELL-MASTER supports extensions to the main dictionary in sideways RAM or ROM. This has the advantage that there is no speed degradation when checking against user dictionaries, since there are no disc accesses required at all. Once a word is added to a user dictionary it is treated as if it is present in the main dictionary.

SPELL-MASTER can support a number of separate dictionaries at once, each sideways RAM or ROM holding up to 3000 additional words. Once a dictionary has been created it can be 'burned' into an EPROM to form a permanent extension to the main dictionary.

Provision is made for editing any dictionary extension, for adding or deleting words in bulk, and directly loading or saving user dictionaries from or to sideways RAM.

Additional star commands

These can be issued from any language ROM such as spreadsheets or BASIC (they can even be included into BASIC programs). Some of the 8 commands are:

`*CROSSWORD` - Will search the entire dictionary for words that exactly fit the search pattern. For example *CROSS. ##M#U#ER would list ARMOURER, COMMUTER, COMPUTER. It takes about 8 seconds to check against all 59,000 words.

`*ANAGRAM` - Will list all the words in the dictionary that contain the same letters as those specified.

`*FUZZY` - Will list all words that sound something like the one you are searching for. If you are not sure of the spelling of a word then entering the approximate spelling here will generally list the word you are looking for.

Price: £59.00 incl.

Upgrades

Owners of the older two chip versions of SPELL-MASTER can upgrade to the single chip version for £25.00. However this new version is functionally equivalent and so it should not be necessary to upgrade.

2nd processors

Due to its unique design SPELL-MASTER will not work with word processors running on the 6502 2nd processor, although there are facilities provided for checking long text files.

VISA

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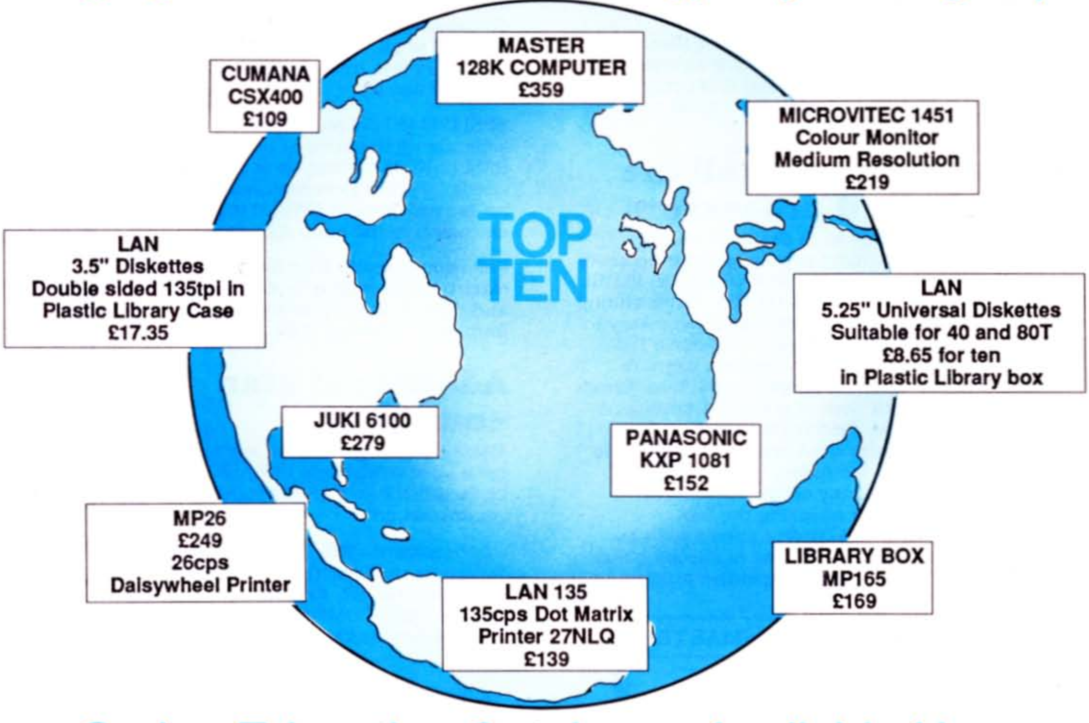

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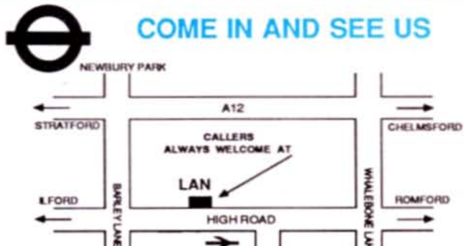

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```
320 OPT FNeb(13):BRK:.ls:]
330 FORJ%=0TOI%:[OPTB%
340 OPT FNs(Nm$(J%))
350 OPT FNeb(Ad%(J%) DIV256)
360 OPT FNeb(Ad%(J%) MOD256)
370 OPT FNew(Ln%(J%))
380 OPT FNeb(p%(J%))
390 OPT FNew(Ld%(J%))
400 OPT FNew(Xq%(J%))
410 ]NEXT:[OPTB%:OPT FNeb(&FF)
420 BRK:.lh%
430 OPT FNs(LEFT$(r$,1))
440 OPT FNeb(&FE):]ENDPROC
450 DEFPROChdr:P%=C%:[OPTB%
460 BRK:BRK:BRK:JMPO%+E%
470 OPT FNeb(&82)
480 OPT FNeb(D% MOD256)
490 OPT FNeb(1)
500 .t%:OPT FNs(r$):.D%:BRK
510 OPT FNs("(C) 1987 Hugh Haskell")
520 BRK:.E%:PHA:CMP#9:BEQh%
530 CMP#4:BEQnr:PLA:RTS:.h%
540 TYA:PHA:TXA:PHA:LDA(&F2),Y
550 CMP#13:BEQsh%:LDX#&FF:DEY
560 .L0:INX:INY:LDAO%+lh%,X
570 CMP(&F2),Y:BEQL0:CMP#&FE
580 BEQprgs:PLA:TAX:PLA:TAY
590 PLA:RTS:.sh%:JSRO%+ph%
600 JMPO%+out:.ph%:JSRM%
610 LDX#&FF:.L1:INX:LDAO%+t%,X
620 JSRK%:BNEL1:JSRM%:RTS
630 .prgs:JSRO%+ph%:JSRM%
640 LDX#&FF:.L2:INX:LDAO%+hdg,X
650 JSRK%:CMP#13:BNEL2:JSRM%
660 LDY#&FF:.stn:LDX#5:LDA#32
670 .spc:JSRK%:DEX:BNEspc:.L3
680 INY:LDAO%+ls,Y:BMInxn
690 JSRK%:BNEL3:.nxn:TAX:JSRM%
700 CPX#&FF:BEQout:TYA:CLC:ADC#8
710 CMP#&FF:BEQout:TAY:BNEstn
720 .nr:TYA:PHA:TXA:PHA:DEY
730 STY86:LDX#&FF:.L4:INX:INY
740 LDAO%+ls,X:BMIfnd:LDA(&F2),Y
750 CMPO%+ls,X:BEQL4:CMP#&2E
760 BNEncd:INY:.L5:INX
770 LDAO%+ls,X:BPLL5:JMPO%+fnd
780 .ncd:INX:LDAO%+ls,X:BPLncd
790 CMP#&FF:BEQout:TXA:CLC:ADC#8
800 CMP#&FF:BEQout:TAX:LDY86
810 JMPO%+L4:.out:PLA:TAX
820 PLA:TAY:PLA:RTS:.fnd:CMP#&FF
830 BEQout:STA83:INX:LDAO%+ls,X
840 STA82:INX:LDAO%+ls,X:STA84
850 INX:LDAO%+ls,X:STA85:INX
860 LDAO%+ls,X:STA86:BEQdef
870 BMIm%:STA24:CMP#&19
880 BEQdef:BCSdef:LDA#&8C:JSRT%
890 .def:LDA24:STA88:LDA#0:STA87
900 .mv%:LDX85:CPX#0:BEQsp%:LDY#0
910 .L6:LDA(82),Y:STA(87),Y:INY
920 BNEL6:INC88:INC83:DEX:BNEL6
930 .sp%:LDY84:.L7:LDA(82),Y
940 STA(87),Y:DEY:BNEL7:LDA(82),Y
950 STA(87),Y:LDA86:BMIms%
960 LDA#&8A:LDX#&00:LDY#79:JSRT%
970 LDY#76:JSRT%:LDY#68:JSRT%
980 LDY#13:JSRT%:LDY#82:JSRT%
990 LDY#85:JSRT%:LDY#78:JSRT%
1000 LDY#13:JSRT%:.ex%:PLA:PLA
1010 PLA:LDA#0:RTS:.m%:INX
1020 LDAO%+ls,X:STA87:INX
1030 LDAO%+ls,X:STA88
1040 LDA#&60:LDY86:CPY#&FF
1050 BNEload:LDA#&4C:.load
1060 STA89:INX:LDAO%+ls,X
1070 STA90:INX:LDAO%+ls,X:STA91
1080 JMPO%+mv%:.ms%:JSR89
 1090 JMPO%+ex%:]ENDPROC
 1100 DEFFNS(n$)
 1110 IFLEFT$(n$,1)=" " n$=RIGHT$(n$,LEN
n$-1):GOTO1110
 1120 IFRIGHT$(n$,1)=" " n$=LEFT$(n$,LEN
n$-1):GOTO1120
 1130 DNm$(I%)=n$
 1140 IFLEFT$(n$,1)=":" n$=RIGHT$(n$,LEN
n$-3)
 1150 IFINSTR(n$,".")=2 n$=RIGHT$(n$,LEN
n$-2)
 1160 =n$
 1170 DEFFNy(y$)
 1180 PRINTCHR$12;y$;" Y/N";
 1190 REPEAT:Z%=INSTR("YyNn*",GET$):UNTI
LZ%
 1200 IFZ%=5 INPUT"*"$S%:PROCos($S%):GO
TO1180
 1210 PRINT:IFZ%<3 =TRUE ELSE =FALSE
 1220 DEFPROCos($S%)
 1230 X%=S% MOD256:Y%=S% DIV256:CALL&FFF
7:ENDPROC
 1240 DEFFNs($S%):$P%=$S%
 1250 P%=P%+LEN$P%:=B%
 1260 DEFFNeb(V%):?P%=V%:P%=P%+1:=B%
 1270 DEFFNew(V%):?P%=V% MOD256:P%?1=V%
DIV256:P%=P%+2:=B%
 1280 DEFPROClfile:err=FALSE
 1290 F%=OPENIN(DNm$(J%)):CLOSE#0
 1300 IFF%>0 THEN1410
 1310 err=TRUE:VDU28,0,3,39,0,12
```

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```
 1320 FORA=0 TO3:VDU31,0,A,132,157,131:N
EXT
 1330 VDU28,3,3,39,0,15
 1340 PRINTCHR$129"Can't find "DNm$(J%)
 1350 PRINT"Change Disk, Directory, Driv
e"
 1360 PRINT"Press RETURN when ready to t
ry again"
 1370 REPEAT:INPUT": "N$
 1380 UNTILLENN$=0ORLEFT$(N$,1)="*"
 1390 IFLENN$>0PROCos(N$)
 1400 GOTO1290
 1410 PROCos("L."+DNm$(J%)+" "+STR$~(Ad%
(J%)-O%))
 1420 IFerr VDU28,0,3,39,0,12,31,11,0,23
,1,0;0;0;0;:PROCscr1a
 1430 ENDPROC
 1440 DEFFNnname(n$):INPUT""R$:IFLENR$=0
 =n$ ELSE =R$
 1450 DEFFNchk(n$):m=ASCn$:IFm>47 ANDm<5
8 =TRUE ELSE =FALSE
 1460 DEFFNletr(n$):n=ASCn$AND&DF:IFn<65
ORn>90=FALSE ELSE =TRUE
 1470 DEFFNinfo($S%)
 1480 FORA=0TO16STEP4:A!96=0:NEXT
 1490 ?96=S% MOD256:?97=S% DIV256
 1500 X%=96:Y%=0:A%=5:CALL&FFDD
 1510 Ld%(I%)=!98ANDG%
 1520 Xq%(I%)=!102ANDG%
 1530 Ln%(I%)=!106ANDG%
 1540 =Ln%(I%)
 1550 DEFPROCpage
 1560 INPUT"PAGE setting :- <ret>=defaul
t  &"p$
 1570 IF NOT FNhx(p$)THEN1560
 1580 IFLENp$=0 p%(I%)=0 ELSEp%(I%)=EVAL
("&"+p$) DIV256
 1590 Ld%(I%)=p%(I%)*256:ENDPROC
 1600 DEFPROClorun
 1610 PRINT"Load <L> or Run <RETURN> ";
 1620 REPEAT Z%=GET:Z%=Z% AND &DF:UNTILZ
%=76 OR Z%=13
 1630 IF Z%=76 p%(I%)=&F0 ELSE p%(I%)=&F
F:Z%=82
 1640 PRINTCHR$Z%:ENDPROC
 1650 DEFPROCrom
 1660 INPUT""ROM name  : "r$
 1670 IFLENr$>7 PRINTCHR$7""Too long to
 save on disk:""(Optional) new name ";:
r$= FNnname(r$)
 1680 IFLENr$=0PRINTCHR$7""You must give
 a name ! :- ";:r$= FNnname(r$):GOTO1670
 1690 ENDPROC
 1700 DEFPROCsize
 1710 INPUT""ROM size . . 16K ";l$
 1720 IFLENl$=0 ORNOT FNchk(l$) l%=0 ELS
E l%=VAL(l$):PRINT
 1730 IFl%=0 ORl%>8 L%=&4000:ENDPROC
 1740 IFl% MOD2<>0 ORl%=6 l%=l%+1:GOTO17
40
 1750 L%=1024*l%:ENDPROC
 1760 DEFPROCfname:REPEAT
 1770 INPUT"File Name "N$
 1780 IFLENN$=0THEN2070
 1790 IFLEFT$(N$,1)="*"PROCos(N$):GOTO17
70
 1800 Nm$(I%)= FNS(N$)
 1810 IF FNlen(Nm$(I%))THEN1770
 1820 F%= FNinfo(DNm$(I%))
 1830 IFF%=0PRINT'CHR$129"No Such File":
PROCos("*."):GOTO1770
 1840 INPUT"Name for use in ROM "$S%
 1850 IFLEN$S%=0 $S%=Nm$(I%)
 1860 IFNOT FNletr($S%)PRINTCHR$7"Names
must start with a letter":GOTO1840
 1870 IF FNlen($S%)THEN1840
 1880 Nm$(I%)=$S%
 1890 IFI%=0GOTO1930 ELSE used=FALSE:FOR
J%=0TOI%-1
 1900 IFNm$(J%)=Nm$(I%) used=TRUE
 1910 NEXT
 1920 IF used PRINT"Used before":GOTO184
0
 1930 Basic=(Xq%(I%)>&8000 AND Xq%(I%)<&
C000)
 1940 P%=C%:PROClist:tl%=P%-C%:Len%=0
 1950 FORJ%=0 TO15:Len%=Len%+Ln%(J%):NEX
T
 1960 Q%=Len%+H%+tl%
 1970 IFQ%>L% PRINT"Not enough room for
that one!!":Ln%(I%)=0:GOTO1770
 1980 IF Basic PROCpage ELSE PROClorun
 1990 PRINT"Space Remaining &";~L%-Q%
 2000 Ad%(0)=&8000+H%+tl%
 2010 FORJ%=1TOI%
 2020 Ad%(J%)=Ad%(J%-1)+Ln%(J%-1)
 2030 NEXT
 2040 I%=I%+1
 2050 IFI%>15PRINTCHR$7"Catalogue full":
GOTO2070
 2060 UNTILFALSE
 2070 UNTILTRUE
 2080 I%=I%-1:ENDPROC
 2090 DEFPROCgfiles
 2100 FORJ%=0TOI%
 2110 PROClfile
 2120 VDU28,0,24,39,8+J%,23,1,1;0;0;0;
 2130 PRINTCHR$130;Nm$(J%)TAB(14)CHR$134
;DNm$(J%)TAB(29)CHR$131;
 2140 IFp%(J%)=0 PRINT"default";:GOTO218
0
 2150 IF p%(J%)<&F0 PRINT"&"+STR$~p%(J%)
+"00";: ELSE PRINT"&"+STR$~Ld%(J%);
 2160 IFp%(J%)=&FF PRINT" r";:GOTO2180
 2170 IFp%(J%)=&F0 PRINT" l";
 2180 PRINT:NEXT
 2190 VDU28,0,24,39,8+J%:REM9+(J%>15)
```

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◄ From Page 147

```
 2200 ENDPROC
 2210 DEFPROCclear
 2220 FORR%=Q%TOL%-4STEP4:C%!R%=TRUE:NEX
T
 2230 IFR%<L% R%?C%=TRUE:R%=R%+1:GOTO223
0
 2240 ENDPROC
 2250 DEFPROCram
 2260 IF NOT master THEN2310
 2270 PRINTCHR$12;"Slot No.";
 2280 REPEATz$=GET$:UNTILFNhx(z$)
 2290 PRINTz$;:b=EVAL("&"+z$)
 2300 OSCLI("SRLOAD "+LEFT$(r$,7)+" 8000
 "+STR$~b+" Q"):GOTO2320
 2310 PROCos("L."+LEFT$(r$,7)+" 8000")
 2320 PRINTCHR$12;CHR$133;SPC6"Loaded "C
HR$129"  -  END";:A=INKEY(200):CLS:ENDPR
OC
 2330 DEFPROCsave
 2340 PROCos("S."+LEFT$(r$,7)+" "+STR$~C
%+" "+STR$~(C%+L%))
 2350 saved=TRUE:ENDPROC
 2360 DEFFNlen(n$)
 2370 IFLENn$>7 PRINTCHR$7"Too long ! 7
chars max":=TRUE ELSE =FALSE
 2380 DEFPROCscr1:VDU26,12,31,11,0,15
 2390 DEFPROCscr1a
 2400 PRINTCHR$&83+"PROGRAM PROMMER"
 2410 PRINTSPC8CHR$&82+"(c) Hugh Haskell
 1987"
 2420 ENDPROC
 2430 DEFPROCscr2:VDU28,0,24,39,4,12
 2440 $S%=CHR$129+r$+CHR$131+": Buffer &
"+STR$~C%+" - &"+STR$~(C%+L%)
 2450 IFLEN$S%<40 PRINTTAB(20-LEN$S%/2);
$S% ELSEPRINT$S%
 2460 PRINT"*" Commands:"" May be entere
d in place of file name"
 2470 VDU28,0,24,39,8:ENDPROC
 2480 DEFPROCscr3:VDU28,0,24,39,5,12
 2490 PRINT'CHR$130"Call name"CHR$134"
  Disk name"CHR$131SPC5"PAGE"
 2500 VDU28,0,24,39,8:ENDPROC
 2510 DEFFNhx($S%)
 2520 IFLEN$S%=0 =TRUE
 2530 a=-1:REPEAT:a=a+1
 2540 IFNOT(S%?a>47ANDS%?a<58)ANDNOT(S%?
a>64ANDS%?a<71)THENUNTILTRUE:=FALSE
 2550 UNTILa=LEN($S%)-1:=TRUE
 2560 DEFPROCsort:REPEATswapped=FALSE
 2570 FORJ%=0TOI%-1
 2580 N%=J%+1
 2590 IFNm$(J%)>Nm$(N%) PROCswap
 2600 NEXT
 2610 UNTILNOTswapped:ENDPROC
 2620 DEFPROCswap
 2630 $S%=Nm$(J%):Nm$(J%)=Nm$(N%):Nm$(N%
)=$S%
 2640 $S%=DNm$(J%):DNm$(J%)=DNm$(N%):DNm
$(N%)=$S%
 2650 !S%=Ln%(J%):Ln%(J%)=Ln%(N%):Ln%(N%
)=!S%
 2660 !S%=Ad%(J%):Ad%(J%)=Ad%(N%):Ad%(N%
)=!S%
 2670 !S%=p%(J%):p%(J%)=p%(N%):p%(N%)=!S
%
 2680 !S%=Ld%(J%):Ld%(J%)=Ld%(N%):Ld%(N%
)=!S%
 2690 !S%=Xq%(J%):Xq%(J%)=Xq%(N%):Xq%(N%
)=!S%
 2700 swapped=TRUE:ENDPROC
```

This listing is included in this month's tape & disc offer. See order form on Page 167.

✓ Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 =    0 0
  50 = F79C C
  60 = 9D8F B
  70 =  4B8 3
  80 = 475D 9
  90 = F627 E
 100 = 15EF A
 110 = 74E0 7
 120 = 8978 D
 130 = FF76 2
 140 = 8B76 5
 150 = 571F 6
 160 = AADE D
 170 = 6E2F 2
 180 = EA78 C
 190 = FD2E 2
 200 = D3B2 2
 210 = 20B5 8
 220 = 9BE6 4
 230 = 32A3 5
 240 = 9CB5 8
 250 = 5C6F 5
 260 = B0A0 3
 270 = 6C0C 3
 280 = FA32 7
 290 = B572 6
 300 = F69B A
 310 = EA1D E
 320 = BEDB 7
 330 = C02B C
 340 = 47F5 0
 350 = D942 F
 360 = 9DC1 3
 370 = 3769 C
 380 = 853F C
 390 = C427 B
 400 = B822 5
 410 = AF47 3
 420 = 9DAA 2
 430 = 988E E
 440 = 5656 4
 450 = 77E9 1
 460 = C03C 2
 470 =  499 F
 480 = FB94 6
 490 = 4743 4
 500 = AC62 F
 510 = 2F80 B
 520 = 9841 7
 530 = 2D4A 3
 540 = 8E54 7
 550 = F860 7
 560 = 25E4 B
 570 = DB3F B
 580 = 6659 E
 590 = C6B9 A
 600 = 6732 1
 610 = 37DC F
 620 = 6288 0
 630 = 4BD5 A
 640 = CEF7 D
 650 = B9B9 2
 660 = 79F3 9
 670 = DFE7 C
 680 =  5CD 2

 690 = A0CF 3
 700 = E16F 3
 710 = 8127 C
 720 = F4C0 0
 730 = 5B8D 2
 740 = 7E43 D
 750 = F3E3 7
 760 = 35CE A
 770 = 7CDE 1
 780 = 3877 6
 790 = 7C38 B
 800 = 3539 7
 810 = 2823 7
 820 = 2DB7 4
 830 = D39A 0
 840 = 664E 9
 850 = 750B 4
 860 = EB07 1
 870 = 9C9F 2
 880 = 93DB 7
 890 = 6AE8 D
 900 = 43EA 0
 910 = 890B C
 920 = F46F 3
 930 = 772F C
 940 = A45D 8
 950 = 251E 3
 960 = 4FC6 7
 970 =  EE9 3
 980 = 5CBF D
 990 = D119 F
1000 = 8DA6 5
1010 = 59F2 5
1020 = E955 E
1030 = B2DA 9
1040 = F276 1
1050 =  6F0 1
1060 = BE93 F
1070 = BB61 7
1080 = 75F7 C
1090 = 8768 E
1100 = FA83 6
1110 = 6FB1 6
1120 = 92D5 5
1130 = 772B 4
1140 = BAD1 5
1150 = F1DD F
1160 = CB37 9
1170 = 726A 0
1180 = B30A E
1190 = D471 7
1200 = EA3D A
1210 = CAC9 0
1220 = 21E2 F
1230 = 89D9 0
1240 = C01C 4
1250 = 72BD E
1260 = F61F 7
1270 = BBCD 3
1280 = AF1E 2
1290 = 2127 5
1300 = 1127 D
1310 = 24F5 6
1320 =  813 C
1330 = 59C8 B
1340 = BACB 1
1350 = B5B2 0
1360 = 3CCE C

1370 = 5E8E 7
1380 = EB91 8
1390 = 7B8E B
1400 = 848D C
1410 = 5523 4
1420 = 68B0 D
1430 = ED0F E
1440 = AF01 C
1450 = 89EB 9
1460 = BA08 9
1470 = DE5A F
1480 = 22F2 D
1490 = 6B16 0
1500 = AADA 6
1510 = 9785 9
1520 = 4A6B 3
1530 =  838 3
1540 = 168E 8
1550 = D1B2 C
1560 = EEED 2
1570 = 5A65 7
1580 = A71E E
1590 = B538 2
1600 = 62FF 1
1610 = 4AAE 4
1620 = 903F 4
1630 = 47B1 D
1640 = ACAF 6
1650 = 74CA 1
1660 = 8891 6
1670 = E08B F
1680 = 792F 6
1690 = ED0F 6
1700 = 96E0 5
1710 =  DB7 E
1720 = 5225 6
1730 = 6C05 3
1740 = BE08 4
1750 = B6CB 3
1760 = 14AF 7
1770 = 3F9B C
1780 = D0B1 8
1790 = DF87 A
1800 = 5415 8
1810 = F94A C
1820 = 7B2C 8
1830 =  204 7
1840 = 9E1D 4
1850 = 8740 D
1860 = E1EE 8
1870 = A7C7 3
1880 = CA81 9
1890 = 2772 F
1900 = 9B3C B
1910 = 2C83 9
1920 = 4FAA 5
1930 = C642 E
1940 = B9A3 7
1950 = 1C0A 6
1960 = 4FF8 D
1970 = 123A 2
1980 = 451E 4
1990 = 798E 4
2000 = 2E05 A
2010 =  3E3 8
2020 = 348B 6
2030 = 2C83 D
2040 = A10E A

2050 = B126 0
2060 = E014 2
2070 = 536F 2
2080 = EF49 6
2090 = 927E 0
2100 = 7557 1
2110 = 81FE D
2120 = 4D55 7
2130 = 3CCC 2
2140 = 99DC A
2150 = 2844 C
2160 = E139 A
2170 = AF2E 7
2180 = 12BF 2
2190 = 445C 4
2200 = ED0F 4
2210 = 4623 2
2220 = 54E5 6
2230 = 5385 B
2240 = ED0F B
2250 = 57C5 C
2260 = AAE4 D
2270 = 178D 7
2280 = 1D23 D
2290 = A4E9 8
2300 = D97B 8
2310 = 32F6 2
2320 = CF02 A
2330 = 7A2C 4
2340 = 270B 5
2350 = 9723 3
2360 =  2B0 E
2370 = 4EA1 9
2380 = ABFE B
2390 = 7C89 4
2400 = F427 6
2410 = A33D C
2420 = ED0F D
2430 = E2C3 C
2440 = D961 9
2450 = DA0A 2
2460 = 7FBB 5
2470 = 69D7 8
2480 = 6446 1
2490 = FD07 5
2500 = 69D7 1
2510 = B0AB 1
2520 = 9BD2 B
2530 = 1483 F
2540 = D883 E
2550 = 7850 4
2560 = 4471 4
2570 = 8B76 F
2580 = 2396 8
2590 = 3CDF 1
2600 = 2C83 9
2610 = 2478 F
2620 = 539F 9
2630 = 2B9D 9
2640 = 2AD8 5
2650 = 46BD 7
2660 =  5A2 C
2670 = 1D8F F
2680 = 21D9 9
2690 = B0A3 9
2700 = D9EB 0
```

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GENIE is a totally self-contained system requiring no access to disk, it is present in your computer from the moment you switch on.

THE SOFTWARE

The GENIE System software—32K of machine code—has an original screen display, using high resolution windows with up to 7 colours on screen, AND 80 column text display. The screen colours are user selectable to give optimum clarity on any monitor.

GENIE provides, a 10 digit calculator with memory, a 100 year calendar, address book, desk diary, notepad and phone book. Information can be accessed by browsing, or by fast search techniques. The notepad is a mini-wordprocessor with word-wrap, and full cursor editing.

GENIE can produce address labels, and pages of the diary notepad can be output to a printer.

In addition to these, stored in GENIE's memory are ASCII tables and lists of commonly used conversion factors eg metric to imperial units.

All the utilities in GENIE are MENU DRIVEN, making full use of cursor and function keys.

THE HARDWARE

GENIE 'lives' on a small circuit board only 3 inches square.

The GENIE System hardware uses a totally new memory paging technique, developed by PMS, which maps 32K of ROM and 64K of RAM into the address space of a single 16K sideways ROM.

The GENIE board is connected to the computer via a single header on 6 inches of ribbon cable. This header plugs into any ROM socket on the main BBC, MASTER or COMPACT board.

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MULTIPROM allows the experienced user to program 2764, 27128, 27256, 27512, 27513 and 27011 EPROMs, including "A" version. Programming of 27256 up types is carried out in 16K blocks to ensure MULTIPROM compatibility with all models of BBC from B to Master. The UVP 1.1 software requires DFS and a disc drive for operation.

The fully cased MULTIPROM plugs into the user port on the BBC microcomputer, taking power directly from the computer, with an onboard converter providing the programming voltage. Two switches with LEDs are provided, one powering down the MULTIPROM to insert or remove an EPROM from the Textool ZIF socket, and one for Vpp on/off. DIP switches enable swift configuration of the MULTIPROM for each type of EPROM. The necessary UVP 1.1 software, which includes fast programming algorithm, is available on Sideways ROM and contains the following commands: – *TEST (blank check), *READ (afsp) (read Eprom to disc), *BLOW (afsp) (blow EPROM with names file), *VIEW (look at contents of memory from &2000), *COMP (afsp) (compare contents of EPROM to disc). When using *VIEW & *COMP, data is displayed in hex and ASCII format.

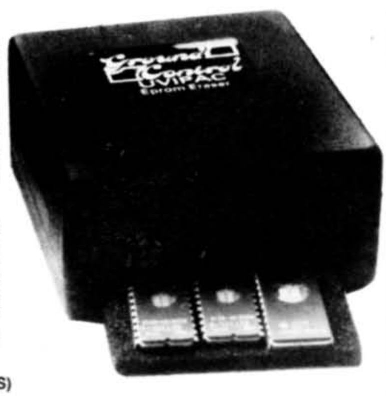
Prices:	MULTIPROM	UVP 1.1 ROM
	£44.95	**£5.00**

EPROMS

Type	1-2	3-9	10+
27C64-25	£2.50	£2.30	£2.20
27C128-25	£3.50	£2.90	£2.60
27128-25	£3.90	£3.70	£3.50
27256-25	£5.00	£4.80	£4.60

NOTE: EPROM prices are changing. Please confirm prices before ordering.

UVIPAC EPROM ERASER



The UVIPAC was designed especially for the home microcomputer enthusiast, but is equally useful in the development lab when quick erasure of just a couple of EPROMs is required.

A special type of discharge tube is used to help achieve the very compact dimensions of the unit, which is housed in a 90 x 80 x 40 mm plastic case. The 230 or 110 volt (+ or -5%) mains powered unit enables up to 3 EPROMs of any size, or 1 CPU with on-board EPROM to be erased in around 15 minutes usually.

The EPROMs are simply loaded into the conductive foam pad supplied and inserted into the unit. After the door has been closed the unit is switched on, an optical fibre indicator showing positively that the unit is in operation. When the required period has elapsed the unit is switched off and the RPROMs removed. The UVIPAC can also be supplied with a built in fixed 15 minute timer, the UVIPAC (T), or with timer and audible time out sounder, the UVIPAC (TS). Spare tubes and conductive foam pads are available if required.

Prices:	UVIPAC	UVIPAC (T)	UVIPAC (TS)
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Prices:	UVIPROM 1 & 32	UVIPROM 2 & 32+	1.1 ROM	2.1 ROM
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DETAILED DATA ON REQUEST

PROGRAM Library No. 4

THIS month we have a couple of Wordwise Plus quickies, an easier way to strip out line numbers, and an excellent idea for filling in standard forms or letters.

There's also a way of reproducing the faint characters found on Apple Macintosh menus, and the ultimate complement to *CAT, we now have *DOG.

Just keep the routines flowing in – we haven't had any languages other than Basic, Wordwise Plus and Machine code yet – where are the BCPL, LISP and Pascal routines?

Send your routines – with full details of the language it is written in and the hardware/software requirements – on disc or tape to:

Steve Turnbull, Library, The Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Remember to enclose a stamped addressed envelope for the return of your media. Five blank discs will be sent to the authors of any routines published.

Title: Faint Characters
Language: 6502 machine code
Author: Petra Galloway

On computers like the Apple Macintosh, when a particular option on a pull-down menu is not available the option text appears in faint type.

It is possible to do this on a BBC Micro by intercepting the character write vector and modifying the character to be output.

The following code does this. When a character is output the routine checks first that it is a printable code, that the screen mode is not 7 (or 135) and that the current character is not part of a VDU command (using osbyte 218).

If all the conditions are satisfied the character definition is acquired using osword 10. Then character 255 is defined as a modified version of the original and printed instead of it.

The routine is automatically saved as a file called Faint which may be initialised by just *faint.

As a demonstration the program installs the code and moves into Mode 4.

```
100 REM Faint Characters
110 REM ----------------
120 PROCinit
130 PROCassem
140 PROCsave
150 CALLcode:MODE4:END
160 ---
170 DEF PROCinit
180 code=&C00
190 wrchv=&20E
200 oscli=&FFF7
210 osbyte=&FFF4
220 osword=&FFF1
230 oswrch=&FFEE
240 ENDPROC
250 ---
260 DEF PROCassem
270 FOR L%=0 TO 2 STEP 2
280 P%=code
290 [OPT L%
300 .start
310  LDA wrchv
320  STA oldwrchv+1
330  LDA wrchv+1
340  STA oldwrchv+2
350  LDA #mywrchv MOD256
360  STA wrchv
370  LDA #mywrchv DIV256
380  STA wrchv+1:RTS
390 .mywrchv
400  STA charbuf
410  CMP #33:BCC oldwrchv
420  CMP #127:BEQ oldwrchv
430  TXA:PHA:TYA:PHA
440  LDA #218
450  LDX #0:LDY #&FF
460  JSR osbyte
470  TXA:BNE exit
480  LDA #135:JSR osbyte
490  TYA:AND #7
500  CPY #7:BEQ exit
510  LDX #charbuf MOD256
520  LDY #charbuf DIV256
530  LDA #10:JSR osword
540  LDA #23:JSR oldwrchv
550  LDA #255:JSR oldwrchv
560  STA charbuf
570  LDY #0:LDX #1
580 .chloop
590  INY:CPY #2
600  BNE chskip
610  LDY #0
620 .chskip
630  LDA charbuf,X
640  AND mask,Y
650  JSR oldwrchv
660  INX:CPX #9
670  BNE chloop
680 .exit
690  PLA:TAY:PLA:TAX
700  LDA charbuf
710 .oldwrchv
720  JMP &FFFF
730 .mask
740  OPT FNequw(&AA55)
750 .charbuf BRK
760  BRK:BRK:BRK:BRK
770  BRK:BRK:BRK:BRK
780 ]:NEXT:ENDPROC
790 ---
800 DEF PROCsave
810 $&700="SA.faint "+STR$~code+" "+ST
R$~P%
820 X%=0:Y%=7:CALL oscli:ENDPROC
830 ---
840 DEF FNequw(W%)
850 !P%=W%:P%=P%+2:=L%
860 ---
```

Title: Form Filler
Language: Wordwise Plus
Author: T.K.Boyd

Writing almost the same letter to several people is something that crops up fairly often in small business and home use. And usually involves rewriting the letter.

Using a Wordwise Plus segment program it is possible to automate this process and makes your word processing much easier.

Type in your letter in its skeleton format – and everywhere information needs to be typed in place a backslash character (\) which appears as 1/2 on the Mode 7 screen, followed by a text prompt and terminated by a second backslash. For example:

```
Dear \Name\
```

Now save your letter, move to segment zero and type in the segment program shown here.

To run it press Shift+f0. The program searches for each occurrence of \, prints up the prompt, deletes it then gets text from the keyboard to insert into the letter. It repeats this until no more insertions are required.

It would be simple to modify the program to print the final result and reload the current form letter.

```
REM Form Filler
Select Text
Cursor Top
Cls
Repeat
Find "\"
If Eot Then Goto exit
Delete At
Repeat
A$=Gct$
Delete Left
If A$<>"\" Then Print A$;
Until A$="\"
Print "? ";
A$=Glk$
Type A$
Until False
.exit
Display
```

Title: Instant Line Stripper
Language: Wordwise Plus
Author: Tim Arrowsmith

Shortly after I wrote the routine published in the March 1987 issue of *The Micro User* to strip line numbers out of Basic programs loaded into Wordwise Plus, I realised there is a much easier way using the global search and replace.

Wordwise Plus allows a wild card character – # – in the search string. Each line number has the form: Return digit digit digit digit digit space.

The first four digits might also be spaces, and the final space only exists if you use list option one.

All you need to do is replace the Return character plus line number sequence with Return only:

```
Search string: |R#####
Replace string: |R
```

If you have used list option one you will have to add another # character to remove it.

Any other leading spaces in a line caused by list options greater than one, or by copying spaces into the line can be removed by repeated replacement of Return followed by Space with Return.

Title: Disc Info
Language: 6502 machine code
Author: Daniel Tang

Being used to a Watford DFS, I was surprised not to see any information about the number of files and format of the disc when cataloguing using an Acorn DFS.

It is very useful to be able to see how many files are on the disc and also the number of tracks the disc is formatted for. The short assembly routine below produces an output similar to that given by a Watford DFS.

When you run the routine it automatically saves the code as file DOG on the current disc. You can find out how many files and the format of your disc by typing *DOG – as opposed to *CAT.

```
 100 REM *DOG
 110 REM ----
 120 osasci=&FFE3
 130 osword=&FFF1
 140 oscli =&FFF7
 150 drive=&10CA
 160 numfs=&1105
 170 dsize=&1107
 180 code=&1200
 190 FOR L%=0 TO 2 STEP 2
 200 P%=code
 210 [OPT L%
 220 .block
 230  OPT FNequd(&00110000)
 240  OPT FNequd(&00530300)
 250  OPT FNequw(&2101)
 260 .dog
 270  LDA drive:STA block
 280  LDX #block MOD256   \Get sector
 290  LDY #block DIV256
 300  LDA #&7F:JSR osword
 310  LDA numfs    \Get file count
 320  CLC:AND #&F1 \Convert file
count
 330  ROR A:ROR A:ROR A
 340  STA numfs
 350  LDA #0        \Change to decimal
 360  STA &70
 370  STA &71
 380 .check
 390  LDA numfs
 400  CMP #10
 410  BCS over
 420  LDA &70
 430  CLC
 440  ADC #&30
 450  JSR osasci
 460  LDA numfs
 470  CLC
 480  ADC #&30
 490  JSR osasci
 500  LDX #10
 510 .loop
 520  LDA text,X
 530  JSR osasci
 540  DEX
 550  BNE loop
 560  LDA dsize  \discover disk size
 570  CMP #&90
 580  BNE et
 590  LDA #&34   \40 track
 600  JMP end
 610 .et
 620  LDA #&38   \80 track
 630 .end
 640  JSR osasci
 650  LDX #10
 660 .loop2
 670  LDA text2,X
 680  JSR osasci
 690  DEX
 700  BNE loop2
 710  RTS
 720 .over
 730  INC &70
 740  LDA numfs
 750  SBC #10
 760  STA numfs
 770  JMP check
 780 .text
 790  OPT FNequs("  no selif ")
 800 .text2
 810  OPT FNequw(&0D00)
 820  OPT FNequs(".skcart 0")
 830 ]:NEXT
 840 $&700="SAVE DOG "+STR$~code+" "+ST
R$~P%+" "+STR$~dog
 850 X%=0:Y%=7:CALL oscli
 860 PRINT"Done.":END
 870 ---
 880 DEF FNequw(W%)
 890 !P%=W%:P%=P%+2:=L%
 900 ---
 910 DEF FNequd(D%)
 920 !P%=D%:P%=P%+4:=L%
 930 ---
 940 DEF FNequs(s$)
 950 $P%=s$:P%=P%+LENs$:=L%
 960 ---
```

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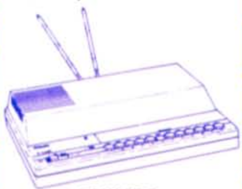

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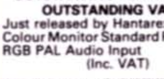

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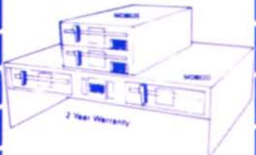

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80 column printer with 160 cps draft and 40 cps NLQ with built in friction and tractor feed. Fully compatible with Epson FX80. Standard parallel interface. **£249.00**

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STAR NB15

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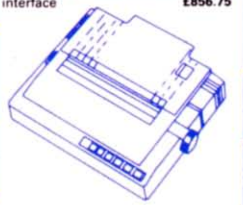


STAR NL-10

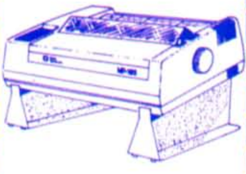
Fine Near-Letter-Quality, 100% compatibility and total reliability all in one easy to use printer. For quality, ease of operation and dependability, nothing beats the Star NL-10. You get outstanding print quality at 120 cps in draft mode and 30 cps in near letter quality. Plus, the sleek NL-10 offers full compatibility with most popular computers through plug in interface cartridges. Just insert the appropriate plug in interface cartridge for your IBM-PC, Commodore, Apple IIc or other parallel computer and your Star NL-10 is ready to print. Touch a button on the control panel to set the print pitch (3 choices), to select the typeface and to print in either draft or NLQ mode. You can even set left and right margins, make top of form settings and control forward and reverse feed in the smallest pitch. **£229.00**

STAR NX-15

Same as Star NL-10 but with 136 column width. Both Epson and IBM compatible **£399.00**

MP200

200 cps in draft. 40 cps in NLQ mode. 7K buffer as standard (128 downloadable characters in NLQ) optional 8K memory. IC font cards. Auto insert–Loads paper automatically to top of form. User friendly control panel–easy print pitch selection. I/F board–quick change of interface to match applications. Cut sheet feeder (optional double bin auto sheet feeder). IBM compatuble. **£274.85**



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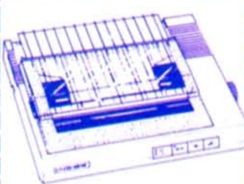

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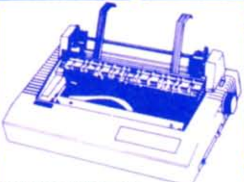

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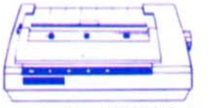

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☆Justified print mode are also available including left, centre, right and full justification
☆9 graphic modes are available
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☆7K input buffer standard can be expanded to 15K
☆Printing modes selectable at front panel (NLQ/draft, Pica/Elite, enlarge, emphasize, condense, italic
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PANASONIC KX-P3131

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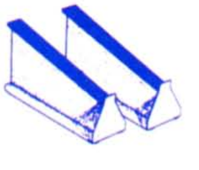

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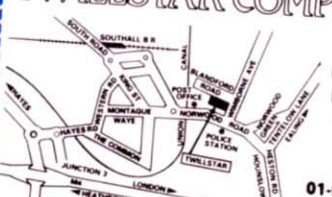

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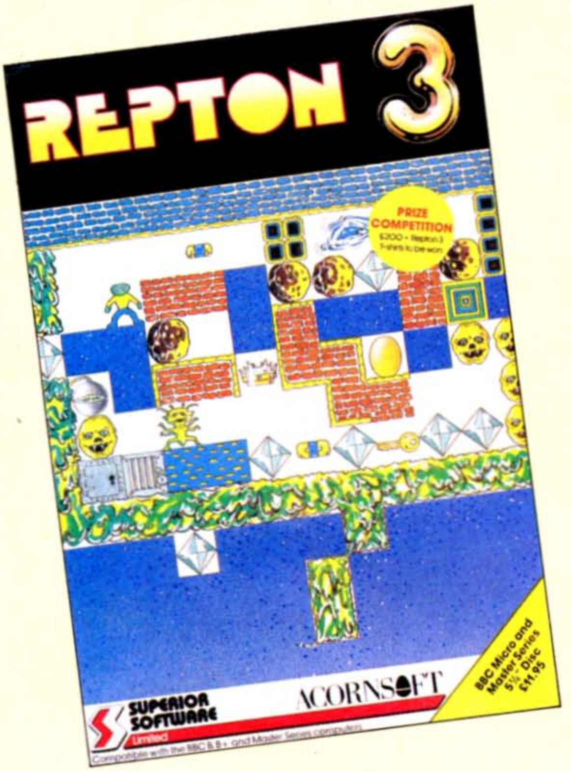
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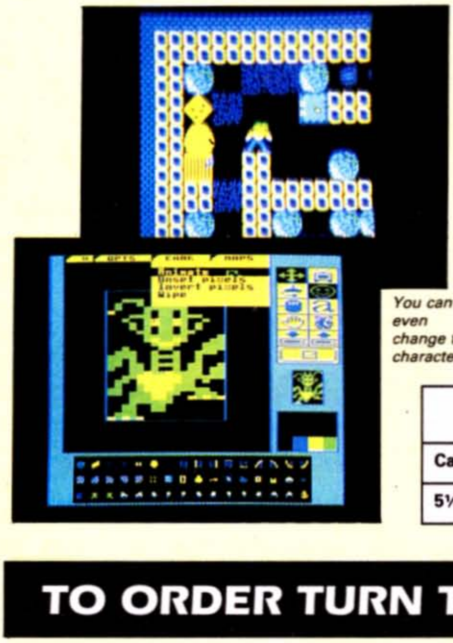

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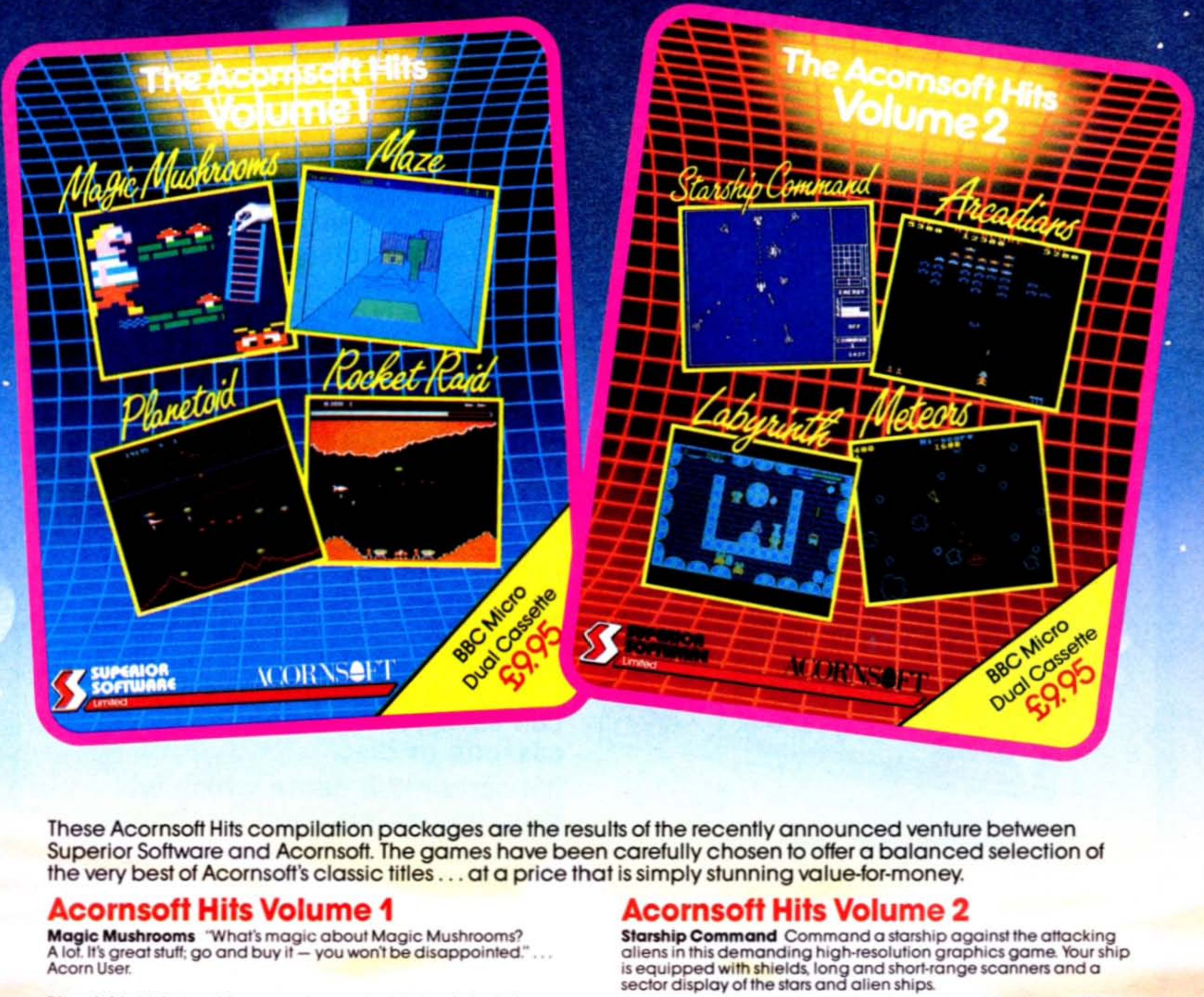
TO ORDER TURN TO THE FORM ON PAGE 167

The Acornsoft Hits

Volumes 1 & 2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These Acornsoft Hits compilation packages are the results of the recently announced venture between Superior Software and Acornsoft. The games have been carefully chosen to offer a balanced selection of the very best of Acornsoft's classic titles . . . at a price that is simply stunning value-for-money.

Acornsoft Hits Volume 1

Magic Mushrooms "What's magic about Magic Mushrooms? A lot. It's great stuff; go and buy it — you won't be disappointed." . . . Acorn User.

Planetoid "It's fast and fun, annoying and addictive. In fact, it's one of the classic micro arcade games." . . . Electron User.

Maze "Maze has certainly become my favourite pastime for the moment, and I'm sure I'll be playing it for some time to come." . . . Acorn User.

Rocket Raid A suberb sideways-scrolling arcade style game. You must fly your spaceship through the planetary caverns wherein are deadly aliens, guided missiles meteor storms and many other hazards.

Acornsoft Hits Volume 2

Starship Command Command a starship against the attacking aliens in this demanding high-resolution graphics game. Your ship is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

Arcadians Watch out for the deadly dive-bombing tactics of the Arcadians as they fly in convoy overhead. 1-player and 2-player options, intriguing music and a demonstration mode are some of the features of this excellent game.

Meteors Steer your laser-ship through a hail of meteors, smashing them with your laser bolts as they hurtle towards you on all sides. Avoid being hit by missiles from the flying saucers. The hyperspace escape facility is available as a last resort.

Labyrinth Guide Mork through the labyrinth, eating fruit to replenish his dwindling energy supply. Crush the Tiger Moths, shoot the Flitterbugs and dodge the Threshers as you venture towards the magic crystals.

Acornsoft Hits Volume 1

Acorn Electron dual cassette	**£9.95**
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Acorn Electron Versions

Rocket Raid and Labyrinth are not available for the Acorn Electron.
The Acornsoft Hits Volume 1 features:
Magic Mushrooms, Planetoid, Maze, Monsters.
The Acornsoft Hits Volume 2 features:
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◀ From Page 117

```
   10 REM ***********************
   20 REM *      McBrolly       *
   30 REM *     Gordon Key      *
   40 REM * (c) The Micro User *
   50 REM ***********************
   60 *FX3
   70 IFTOP>&3000MODE7:PROCshorten:ELSE:
MODE2
   80 PROCinit:ONERROR:X%=255:CALL&E00
   90 REPEAT:PROChisc:PROCgame:UNTIL0
  100 DEFPROCgame:C%=0:J%=0:H%=0:F%=0
  110 j%=0:R%=RND(7)-1:s%=&10:Z%=0:B%=0
  120 K%=0:d%=0:c%=1:L%=5:h%=0:PROCroom
  130 REPEAT:X%=xm%:Y%=ym%:x%=0:y%=0
  140 D%=0:t%=0:v%=128:b%=180:TIME=101
  150 REPEAT:IFTIME>100:PRINTTAB(1,1)STR
ING$(3-LENSTR$b%,"0");b%;:TIME=0:c%=c%EO
R5:VDU19,15,c%;0;:b%=b%-1:IFb%=TRUE PROC
ouch:GOTO200
  160 d%=EVALf$:CALL&E00:IFF%PROCjump
  170 Y%=Y%+J%:X%=X%+x%:x%=FNu
  180 IFINKEY-105C%=C%AND2:ELSEIFINKEY-7
3C%=C%OR1
  190 IFF%=0J%=FNfall
  200 UNTIL(X%=P%ANDY%=Q%)ORL%=0:IFL%AND
O%>TRUE:PROCouch
  210 IFL%=0UNTIL1:ELSEPROCscore:UNTIL0
  220 X%=245:CALL&E00
  230 ENDPROC
  240 DEFFNx1:IFF%=14IFc%=1:=12:ELSE:=d%
  250 DEFFNx2:c%=4:IFF%<14:=d%
  260 IFF%=14ORO%>2:=12
  270 IFNOTINKEY-74ANDY%>36u%=62:CALLV%,
u%:ELSEIFO%>1ANDY%<37:=12
  280 =d%
  290 DEFFNx3:IFF%=14:=12
  300 IFh%=12:h%=0:IFp%<10p%=p%+1:u%=4:C
ALLU%,u%,v%:IFp%=10GCOL0,13:MOVEox%(0),o
y%(0):VDU5,136,4:SOUND&12,2,180,20
  310 =d%
  320 DEFFNx4:IFF%=14:=12
  330 IFh%=12IFNOTO%:h%=0:GCOL0,13:MOVEo
x%(O%),oy%(O%):VDU5,136,4:SOUND&12,2,180
,20
  340 =d%
  350 DEFFNx5:IFO%>3:=FNx4
  360 IFh%=12:h%=0:t%=105
  370 IFt%c%=4:VDU19,15,4;0;:t%=t%-1:IF(
t%AND7)=0SOUND&12,-15,t%*2,1
  380 IFt%=0c%=1:VDU19,15,1;0;
  390 =FNx1
  400 DEFFNx6:IFh%<>12=FNx1:ELSEIFO%:=FN
x4
  410 IFX%>10v%=TRUE:h%=0:=FNx1
  420 IFv%=-1IFh%=12COLOUR128:VDU28,8,20
,11,16,12,26:COLOUR135:v%=0:SOUND&12,2,1
00,20
  430 =d%
  440 DEFFNu:IFJ%J%=J%+j%
  450 IFH%:=FNget(H%,1)
  460 IFB%:=FNget(B%,-1)
  470 IFINKEY-98C%=C%OR2:=TRUE
  480 IFINKEY-67C%=C%AND1:=1
  490 =0
  500 DEFFNget(c%,f%)
  510 SOUND&13,2,1,10:J%=0:j%=0
  520 x%=(((C%AND2)=0)-((C%AND2)=2))*f%:
h%=c%:B%=0:H%=0
  530 IFc%<13:=x%
  540 LOCALh%,v%:h%=X%*16:v%=1023-Y%*4
  550 FORT%=0TOO%
  560 IFABS(ox%(T%)-h%)<60ANDABS(oy%(T%)
-v%)<120GCOL3,13:MOVEox%(T%),oy%(T%):VDU
5,ob%(T%),4:SOUND&12,2,200,20:ox%(T%)=ox
%(O%):oy%(T%)=oy%(O%):ob%(T%)=ob%(O%):T%
=O%:O%=O%-1:S%=S%+25:PRINTTAB(13-LENSTR$
S%,1);S%
  570 NEXT:=x%
  580 DEFPROCjump
  590 IFJ%<>-K%IFF%IFy%=0J%=0
  600 IFJ%ENDPROC
  610 IFF%=7s%=&10:d%=0:ELSEs%=&12:IFd%>
6PROCouch:ELSEK%=3:d%=0
  620 IF(C%AND1)K%=3:ENDPROC:ELSEIFK%>12
K%=12
  630 IFINKEY-74d%=0:J%=-2+(F%<14)*K%:j%
=1:Z%=4:SOUNDs%,2,50+K%,5:ELSEIFK%>4K%=K
%DIV2:IFK%>3J%=-K%:j%=1:Z%=4:SOUNDs%,2,5
0+K%,5
  640 ENDPROC
  650 DEFPROCscore:IFO%<>TRUE:ENDPROC
  660 b%=b%*L%:FORT%=20TO200STEP20:SOUND
1,2,T%,3:SOUND2,2,T%+40,3:NEXT:C%=0
  670 FORT%=1TOb%STEP2:N%=S%+T%:PRINTTAB
(13-LENSTR$N%,1);N%:SOUND&10,1,4,1:NEXT
  680 TIME=0:REPEATUNTILTIME>200:S%=S%+b
%:R%=(R%+1)MOD7
  690 b%=180:X%=255:CALL&E00:PROCroom
  700 ENDPROC
  710 DEFPROCouch:G%=C%:VDU19,3,1;0;
  720 FORT%=0TO20:C%=T%MOD4:CALL&E00
  730 SOUND&12,2,1,2:SOUND&11,2,240,2
  740 REPEATUNTILADVAL-6=15:NEXT
  750 VDU19,3,3;0;:b%=180:C%=G%:d%=0
  760 J%=0:j%=0:K%=6:F%=0:L%=L%-1
  770 IFL%X%=xm%:Y%=ym%
  780 PRINTTAB(17,1);L%
  790 ENDPROC
  800 DEFFNfall:IFJ%<0:=J%
  810 IFZ%Z%=Z%-1ELSEx%=0
  820 IF(C%AND1)K%=3::d%=0
  830 IFH%x%=FNget(H%,1):=0:ELSEIFB%:x%=
FNget(B%,TRUE):=0
  840 y%=Y%AND3:D%=D%EORTRUE:IFD%K%=K%+1
:d%=d%+1
  850 IFy%j%=-y%:=y%
  860 j%=1-((C%AND1)=0)*3
  870 =j%
  880 DEFPROCinit:S%=0:V%=&1070:U%=&108E
:DIMox%(9),oy%(9),ob%(9),hs%(10),hs$(10)
  890 FORT%=1TO10:hs%(T%)=(11-T%)*500:hs
$(T%)="McBrolly..":NEXT:ENDPROC
  900 DEFPROCmode(M%)
  910 VDU22,M%,23;8202;0;0;0;19,0,6;0;19
,4,0;0;19,10,6;0;19,11,0;0;19,6,4;0;19,1
5,1;0;19,14,4;0;19,13,4;0;19,12,1;0;:END
PROC
  920 DEFPROChisc:PROChead:PROCmup:S%=0
  930 PROCbel(120):PRINTTAB(0,3)FNlines
  940 FORT%=0TO11:PRINTTAB(32,5+T%)CHR$1
56TAB(7,5+T%)CHR$129CHR$157CHR$135;:IFT%
MOD11PRINThs$(T%)STRING$(20-LENhs$(T%)-L
ENSTR$hs%(T%),".");hs%(T%);" "
  950 NEXT:PRINT''FNlines
  960 IFI%<>TRUE PROCgname
  970 PROCbel(120):PRINTTAB(6,22)CHR$136
"PRESS THE SPACE BAR TO PLAY":REPEATUNTI
LINKEY-99
  980 PROCbel(100):PROCmode(2)
  990 ENDPROC
 1000 DEFPROCbel(N%):SOUND&11,2,N%,20
 1010 ENDPROC
 1020 DEFPROChead:PROCmode(7)
 1030 FORT%=0TO1:PRINTTAB(12,T%)CHR$141C
HR$132CHR$157CHR$135"McBrolly  "CHR$156:
NEXT
 1040 PRINTTAB(15,3)"By G.J KEY"
 1050 ENDPROC
 1060 DEFPROCmup
 1070 IFS%<=hs%(10):I%=TRUE:ENDPROC
 1080 I%=10:REPEAT:IFhs%(I%-1)<S%:hs%(I%
)=hs%(I%-1):hs$(I%)=hs$(I%-1):I%=I%-1
 1090 UNTILI%=1ORhs%(I%+(I%<>FALSE))>=S%
 1100 hs%(I%)=S%:hs$(I%)=STRING$(10,".")
 1110 ENDPROC
 1120 DEFPROCgname
 1130 PROCbel(160):PRINTTAB(8,22)CHR$136
"PLEASE ENTER YOUR NAME"
 1140 T%=0:$&380=hs$(I%)
 1150 PRINTTAB(9,5+I%)CHR$131;:*FX21
 1160 REPEAT:i%=GET:IFi%=13hs$(I%)=$&380
:UNTILTRUE:PRINTTAB(9,5+I%)CHR$135:ENDPR
OC:ELSEIFi%<32ORi%>127UNTILFALSE
 1170 IFT%<10ANDi%<>127VDUi%:T%?&380=i%:
T%=T%+1
 1180 IFT%>0ANDi%=127VDU8,46,8:T%=T%-1:I
FT%<>10T%?&380=46
 1190 UNTILFALSE
 1200 ENDPROC
 1210 DEFFNlines:=CHR$146+STRING$(38,CHR
$243)
 1220 DEFPROCroom
 1230 COLOUR133:CLS:GCOL0,128
 1240 VDU24,32;24;1247;960;16,26
 1250 LOCALX%,Y%,T%,I%
 1260 GCOL0,5:MOVE0,920:MOVE0,960
 1270 X%=0:REPEAT:X%=X%+RND(6)*8
 1280 PLOT85,X%,960-(RND(10)*4+16)
 1290 PLOT85,X%,960:UNTILX%>1280
 1300 T%=153:GCOL2,4:VDU5
 1310 FORY%=31TO1023STEP32
 1320 FORX%=0TO1279STEP64
 1330 MOVEX%,Y%:VDUT%:T%=T%+1
 1340 IFT%>159T%=153
 1350 IFY%<895ANDY%>31X%=X%+1159
 1360 NEXT:NEXT
 1370 GCOL0,2:MOVE32,24:MOVE1247,24:PLOT
85,32,31:PLOT85,1247,31:VDU4
 1380 COLOUR135:COLOUR6:PRINTTAB(1,1)"00
0"TAB(6,1)" "STRING$(6-LENSTR$S%,"0");S%
;" "TAB(16,1)" ";L%;" "
 1390 W%=&1200+100*R%:T%=0:I%=LEN$W%:VDU
5:O%=0
 1400 f$="FNx"+CHR$(?W%):xm%=FNr2*2:ym%=
FNr2*4:T%=3
 1410 REPEAT:MOVEFNr,FNr:G%=EVAL("FN"+CH
R$(T%?W%)):T%=T%+1
 1420 IFG%PROColdco:ox%(O%)=X%:oy%(O%)=Y
%:ob%(O%)=G%:O%=O%+1
 1430 UNTILT%>=I%:VDU4:O%=O%-1
 1440 ENDPROC
 1450 DEFPROColdco:X%=&80:Y%=3:A%=13:CAL
L&FFF1:Y%=!&386 AND&FFFF:X%=!&384 AND&FF
FF:ENDPROC
 1460 DEFFNr:A%=FNr1:T%=T%+1:=A%*32-1
 1470 DEFFNr1:=T%?W%-48
 1480 DEFFNr2:T%=T%+1:=FNr1
 1490 DEFFNa:GCOL0,2:VDU5,128,128:PLOT0,
-128,-8:GCOL0,5:VDU129,130:PLOT0,-112,-3
2:VDU138:PLOT0,-72,32:GCOL2,4:VDUFNrc,FN
rc:PLOT0,-120,-32:VDUFNrc:=FALSE
 1500 DEFFNb:VDU18,0,1,133,8,18,0,6,131,
132,8,18,0,1,134:=FALSE
 1510 DEFFNc:PROCc2(2):=FALSE
 1520 DEFFNd:PROCc2(14):=FALSE
 1530 DEFFNe:PROCc2(15):=FALSE
 1540 DEFFNf:FORN%=1TOFNr2:GCOL0,5:VDU13
8,8:GCOL2,4:VDUFNrc,8,10:NEXT:=FALSE
 1550 DEFFNg:E%=FNr2*4:FORN%=1TOFNr2:Y%=
FNa:PROColdco:D%=Y%:REPEAT:VDU10,8:GCOL0
,5:VDU138,8:GCOL2,4:VDUFNrc:D%=D%-32:UNT
ILD%<32:MOVEX%+48,Y%+E%:NEXT:=FALSE
 1560 DEFFNh:GCOL0,4:VDU137,137,8,8:GCOL
0,7:VDU139,140:P%=FNr2*2:Q%=FNr2*4:=FALS
E
 1570 DEFFNi:LOCALX%,Y%,T%:PROColdco:VDU
29,X%;Y%-12;:GCOL0,6:MOVESINRAD315*80,CO
SRAD315*108:FORT%=72TO342STEP27:GCOL0,2:
MOVE0,0:PLOT85,SINRAD(T%-27)*80,COSRAD(T
%-27)*108
 1580 IFT%<>342GCOL0,6:MOVESINRAD(T%-13)
*120,COSRAD(T%-13)*144:PLOT85,SINRADT%*8
0,COSRADT%*108:MOVESINRAD(T%-27)*80,COSR
AD(T%-27)*108
 1590 NEXT:GCOL0,14:PLOT0,-56,0:PLOT0,0,
-12:PLOT81,216,12:PLOT81,0,-12:GCOL0,7:P
```

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```
LOT0,-168,-24:VDU141,142,8,8:GCOL0,4:VDU
143,144:PLOT0,-96,-32:GCOL0,4:VDU145:PLO
T0,-72,-48:PLOT1,72,0:VDU26:=0
 1600 DEFFNj:LOCALN%:FORN%=1TOFNr2:PROCc
3(3):PROCc3(15):NEXT:=FALSE
 1610 DEFFNk:GCOL0,2:PLOT0,8,0:PLOT0,0,-
16:PLOT81,240,16:PLOT81,0,-16:GCOL0,4:PL
OT1,-240,0:PLOT0,104,0:PLOT0,32,0:PLOT81
,-32,-256:PLOT81,32,0:GCOL0,7:PLOT0,48,-
48:PLOT81,-80,48:PLOT81,-48,-48:VDU26:=F
ALSE
 1620 DEFFNl:FORN%=1TOFNr2:GCOL0,3:VDU12
8:GCOL0,15:VDU128:NEXT:=FALSE
 1630 DEFPROCc2(c%):FORN%=1TOFNr2:PROCc3
(c%):NEXT:ENDPROC
 1640 DEFPROCc3(c%)LOCALA%,X%:A%=255:GCO
L0,c%:VDU128:GCOL0,5:PLOT0,-64,-8:VDU137
,8:GCOL2,4:VDUFNrc,8,10:X%=40:REPEAT:GCO
L0,5:VDUFNrd,8:GCOL2,4:VDUFNrc,8,10:X%=X
%+32:UNTILX%=136:PLOT0,64,X%:ENDPROC
 1650 DEFFNrd:LOCALT%:VDU23,151:FORT%=0T
O7:A%=A%ANDNOT(2^(RND(8)-1)):VDUA%:NEXT:
=151
 1660 DEFFNrc:=RND(7)+152
 1670 DEFFNw:p%=0:=136
 1680 DEFFNx:VDU18,0,12,146:=FALSE
 1690 DEFFNy:VDU18,0,13,135,8:=135
 1700 DEFFNz:VDU18,0,13,136,8:=136
 1710 THEEND
 1720 DEFPROCcode:*TAPE
 1730 VDU&8017;&FFFF;0,0,0,0,0,0
 1740 VDU&8117;255,127,127,31,31,7,3,3
 1750 VDU&8217;&FEFF;&F8FE;&E0F8;&C0C0;
 1760 VDU&8317;0,0,0,0,63,63,0,0
 1770 VDU&8417;0,0,0,0,252,252,0,0
 1780 VDU&8517;0,0,0,0,192,192,192,192
 1790 VDU&8617;0,0,0,0,3,3,3,3
 1800 VDU&8717;12,18,18,18,33,45,33,30
 1810 VDU&8817;12,18,33,63,63,30,30,12
 1820 VDU&8917;&FFFF;&FFFF;&FFFF;&FFFF;
 1830 VDU&8A17;15,15,15,15,15,15,15,15
 1840 VDU&8B17;&85E8;&E285;&8585;&E8,0
 1850 VDU&8C17;&1297;&1212;&1212;&92,0
 1860 VDU&8D17;0,28,62,56,56,62,28,0
 1870 VDU&8E17;0,56,124,28,28,124,56,0
 1880 VDU&8F17;28,34,65,71,71,65,34,28
 1890 VDU&9017;&4438;&E282;&82E2;68,56
 1900 VDU&9117;&1818;&3C3C;&7E7E;&FFFF;
 1910 VDU&9217;0,0,8,24,48,96,64,0
 1920 FORT%=153TO159:VDU23,T%:FORI%=1TO8
:VDURND(255):NEXT:NEXT
 1930 ENVELOPE1,1,0,0,0,0,0,0,90,-90,0,0
,90,0
 1940 ENVELOPE2,3,6,0,-6,2,2,2,126,-4,-4
,-4,126,0
 1950 FORT%=0TO2STEP2:vp=&80:P%=&E00
 1960 [OPTT%:LDX#13:LDY#20:.l:LDA&600,Y
 1970 STAvp,X:DEX:DEY:LDA&600,Y:STAvp,X
 1980 DEY:DEY:DEX:BPLl:RTS:]:NEXT
 1990 CALL&E00,X%,Y%,C%,J%,H%,F%,B%
 2000 P%=&E00:FORT%=0TO60:READA$
 2010 FORI%=1TO27STEP2:N%=FNeval(I%)
 2020 ?P%=N%:P%=P%+1:NEXT
 2030 NEXT:D%=&900:FORN%=0TO2STEP2
 2040 FORT%=1TO6:READ$&380:FORI%=1TOLEN$
&380STEP2:B$=MID$($&380,I%,2):E%=1:IFB$>
"ZZ"E%=ASCB$-96:B$=MID$($&380,I%+2,2)
 2050 FORF%=1TOE%:?D%=EVAL("&"+B$)
 2060 D%=D%+1:NEXT:NEXT:NEXT:NEXT
 2070 ?&79=7:P%=&114C:FORT%=0TO31
 2080 !P%=&3000+T%*640:P%=P%+2:NEXT
 2090 D%=&1200:FORT%=0TO6:READ$D%
 2100 D%=D%+100:NEXT
 2110 ENDPROC
 2120 DEFFNeval(I%)
 2130 =EVAL("&"+MID$(A$,I%,2))
 2140 DATAA000847DB1801007A9C085724C30
 2150 DATA0EC902B004A902D006C9499002A9
 2160 DATA48857191800B1828D42118590B184
 2170 DATA8D3511204010AD3511290148AD35
 2180 DATA1129028D351168CD3C11F0158D3C
 2190 DATA116A9006A906A200F004A900A206
 2200 DATAA00A202010A571CD3611F01DA000
 2210 DATAB186D017A008AD4B11AA49068D4B
 2220 DATA11202010A243A011A90720F1FFA9
 2230 DATA1320F4FFAD4211C964B00320FF0F
 2240 DATAA201BD36119590B57195929D3611
 2250 DATA959ACA10EFAE3411BD38118DED0E
 2260 DATAE8BD38118DEE0EAE35118E3411BD
 2270 DATA38118DF40EE8BD38118DF50EA000
 2280 DATA847A847C847B8478A2DEA9248577
 2290 DATA18A59065788594A5916900859518
 2300 DATAA59265788596A59369008597BD00
 2310 DATAC051949194BD00C051969196CAC6
 2320 DATA77F030E694D002E695A5942479D0
 2330 DATA0B1869788594A59569028595E696
 2340 DATAD002E697A5962479D0CA18697885
 2350 DATA96A59769028597D0BDCA18A57869
 2360 DATA088578C930D093C67DAD3C11D004
 2370 DATAA940857DAE3411BD38118D770FE8
```

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2380 DATABD38118D780FA2DEA59A29F88573
2390 DATAA59A29078570A59B8574A9258577
2400 DATAA573859CA574859DA470BD00C0F0
2410 DATA3DC57D9008C98AF004C945D03151
2420 DATA9CF02D48A577C901D00B68C90490
2430 DATA21057C857CD01BAD34112902D00B
2440 DATAE095B00B68057A857AD009E04AB0
2450 DATAF568057B857BCAF028C677F016C8
2460 DATAC008D0B218A59C6980859CA59D69
2470 DATA02859DA000F0A118A57369088573
2480 DATA908AE6744C680FA57A200A109188
2490 DATAA57C200A10918AA57B200A10918C
2500 DATAAD4211C963900AA000A21488D0FD
2510 DATACAD0FA60A00084908491A2040A26
2520 DATA900A2691CAD0F7A590059160488E
2530 DATA3E118C3D11A90CA23DA01120F1FF
2540 DATA688D3E11EE3D11A23DA011A90C4C
2550 DATAF1FF8472A20306712672CAD0F9A5
2560 DATA90290718657185719002E672A590
2570 DATA4A4A29FEAA18BD4C1165718571E8
2580 DATABD4C116572857260A000B18238E9
2590 DATA04918220000EA928859720FB10B1
2600 DATA82A818692485904C9A10A9048597
2610 DATA20FB10B1928590A88A489848A000
2620 DATA204010A5718592A5728593681865
2630 DATA978590688571204010A9108596A2
2640 DATA10A000B1719192C8982903D0F6C8
2650 DATAC8C8C8CAD0EFA5718594A5728595
2660 DATA201711A5948571A5958572A59285
2670 DATA94A593859520171 1A5948592A595
2680 DATA8593C696D0C160AD01068590AD02
2690 DATA068591AD04068592AD05068593A0
2700 DATA00B1908571AA6018A59469048594
2710 DATA9002E6952479D00D18A594697885
2720 DATA94A59569028595600000000C0FF08
2730 DATADD090000343AD42600110001008 5
2740 DATA00010000003080320035803700 3A
2750 DATA00zz00cc00CCCC880000
2760 DATA00bb00ii8Aoo008844ccCC00
2770 DATA000082cc00ii451B1Bcc44bb66cc44
CC44ccCC44
 2780 DATA038000C382ee0F2530bb0F300F0F00
222033333A3F303020200044bbCC4400
 2790 DATA0340206030ff0F300F0F1Acc0F1B33
33bb31cc3000004444bb00
 2800 DATA0041410000ee0F2530ee051000ff10
hh00
 2810 DATA0082820000ff0F30ee0A2000ff20hh
00
 2820 DATA03801090300F0F3333bb250Fbb25cc
0F273333bb32cc3000008888bb00
 2830 DATA034000C341ff0F30bb0Fbb25001110
3333353F303010100088bbCC8800
 2840 DATA000041cc00ii8A2727cc88bb99cc88
CC88ccCC88
 2850 DATA00bb00ii45oo004488ccCC00
 2860 DATA00zz00cc00CCCC440000
 2870 DATA1292Gc2>;f;7;c:9;e222b=2yE<b@2
zLKzJAy>Ca>GyK2gB2S2bR7yO>aT>z2CyODhOK
 2880 DATA2292Gc27:j6=Gd9D9f9S8i22b2CzA2
zSLyELySCz=>yA>yE>yI>yM>yJ6hLe
 2890 DATA5292Gc2;<e:;1l50<c41Bx22bS=bVL
xDGd5SAyELyILySLy4AwA5wE5wI5wM5wS8hTe
 2900 DATA14:2Fc38Fj6PFc25<c29<j6Q<c3S=b
22b>LzBLzFLzJLz2Lh2;?ByCByGByKByK8zS8y
 2910 DATA3J9=Gd5JGd2H>d25AwQDzMAzQ>zM;z
P8zE8yAAy>LyDLy2;k4<b1Kx=2bS8hTe
 2920 DATA4KN1Hx26c227b66g25Q2bJ<c2J=bR@
wD9w6Cc2:Cj48Hw@HwLHwD9wR@wSEaSKhT=
 2930 DATA68G26c6L6c527b<@f@K@f@7@c=R7bV
Hx1Hx@6z7HwNHw7HwNHw7HwNHw7HwNHwH8hIe
 2940 DEFPROCshorten:PROCmode(7)
 2950 IFPAGE<>&1500 PROCrelocate
 2960 PROChead:G$=CHR$130:PRINT''G$"Find
 your way around the jelly mines,"'G$SPC
3"to collect the missing jam pots"''
 2970 Y$=CHR$131:D$=G$+"........"+CHR$13
4:PRINTTAB(8,9)"Use the following keys,"
TAB(8,11)Y$"Z"D$"Move left"TAB(8,13)Y$"X
"D$"Move right"TAB(8,15)Y$"*"D$"Brolly u
p"TAB(8,17)Y$"?"D$"Brolly down"
 2980 PRINTTAB(8,19)Y$"RETURN"G$"..."CHR
$134"JUMP"TAB(0,21)FNlines;TAB(5,23)CHR$
136Y$"PLEASE WAIT A SHORT WHILE"
 2990 PROCcode:T%=PAGE+1:A$=STRING$(255,
"*"):REPEAT:T%=T%+LEN$T%+1
 3000 IF?T%=255CLS:PRINTTAB(0,10)"LINE 1
700 IS MISSING OR INCORRECT"CHR$7:END
 3010 A$=$(T%+3):REPEAT:IFLEFT$(A$,1)="
"A$=RIGHT$(A$,LEN(A$)-1)
 3020 UNTILLEFT$(A$,1)<>" "
 3030 UNTILLEFT$(A$,6)="THEEND"
 3040 PROCbel(200):REPEAT
 3050 PRINTTAB(4,23)CHR$(RND(7)+128)"PRE
SS SPACE WHEN YOU ARE READY"
 3060 UNTILINKEY-99:PROCbel(120)
 3070 ?T%=&FF:*FX3,2
 3080 *KEY0OLD|MRUN|M
 3090 *FX138,0,128
 3100 END
 3110 DEFPROCrelocate:*FX138,0,128
 3120 PRINTTAB(0,10)"PLEASE WAIT WHILST
I RELOCATE TO &1500"':*FX3,2
 3130 IFPAGE<&1500:*KEY0FORT%=TOP-PAGE T
O-4STEP-4:T%!&1500=T%!PAGE:N.:PAGE=&1500
|MOLD|MRUN|M
 3140 IFPAGE>&1500:*KEY0FORT%=0TOTOP-PAG
E STEP4:T%!&1500=T%!PAGE:N.|MPAGE=&1500|
MOLD|MRUN|M
```

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 =    0 0
  50 =    0 0
  60 = 71CE E
  70 = 89E3 F
  80 = 154C 6
  90 = AA2B 8
 100 = 833A 5
 110 = AE86 A
 120 = D5BA E
 130 = E1FB 8
 140 = 2E2B 0
 150 = FCA8 E
 160 = 1799 5
 170 = 476E 0
 180 = 8E4F 1
 190 = AF95 1
 200 = E8B7 1
 210 = C0E2 B
 220 = 2A37 4
 230 = ED0F E
 240 = FB3D F
 250 = E54C 7
 260 = A2E0 0
 270 = 739B 3
 280 = 34DD C
 290 = E4D3 2
 300 = E08C 6
 310 = 34DD E
 320 = EC98 0
 330 = 59E5 2
 340 = 34DD 5
 350 = D14C 4
 360 = BD2F E
 370 = 21F5 A
 380 = CA97 8
 390 = D3B1 4
 400 = 6146 7
 410 = 4CB5 8
 420 = AD94 D
 430 = 34DD 2
 440 = 2343 3
 450 = CFF0 9
 460 = 3DAE 4
 470 = 7D64 0
 480 = E7EE 2
 490 = 459A B
 500 = 1AE5 9
 510 =  913 F
 520 = A28C 7
 530 = E019 1
 540 = CADA 2
 550 = DA02 A
 560 = 614E 9
 570 = 2CF7 C
 580 = 9042 B
 590 = 68C4 4
 600 = 1BB7 F
 610 = 85EE D
 620 = A6EF C
 630 = 9CB0 B
 640 = ED0F C
 650 = EAFE B
 660 = 4011 2
 670 = C7A2 7
 680 = 517D 9
 690 = F9AC A
 700 = ED0F 3
 710 = 5BA4 1
 720 = 5169 6
 730 = A478 1
 740 = 4AB1 D
 750 = 114E 4
 760 = DDB1 6
 770 = 37C4 D
 780 = 1043 A
 790 = ED0F A
 800 = 39CE F
 810 = E8D5 A
 820 = ECD6 7
 830 = 333F 0
 840 = D822 C
 850 =  F86 C
 860 = F2A9 9
 870 = 17D2 5
 880 = CD67 E
 890 = 6B86 5
 900 = 78B9 4
 910 =  7C5 0
 920 = 5685 C
 930 = 7F7F D
 940 = DE50 4
 950 = A4CD 3
 960 = DD99 7
 970 = 2BCA E
 980 = 4382 8
 990 = ED0F 6
1000 = C724 8
1010 = ED0F D
1020 = 8B1F 4
1030 = 88CE 8
1040 = BEC0 3
1050 = ED0F 5
1060 = 34BC 4
1070 =  4C6 6
1080 = FABE B
1090 = 1E93 E
1100 = A4E6 1
1110 = ED0F F
1120 = D936 7
1130 = EE80 D
1140 = C1D1 B
1150 = F20D 7
1160 = BBFF 3
1170 = A643 3
1180 = CB50 6
1190 = E014 6
1200 = ED0F D
1210 = 4759 2
1220 = 2F7A 9
1230 = D45E C
1240 = A283 8
1250 = C228 8
1260 = 10E4 B
1270 = 1379 2
1280 = 6CF9 9
1290 = 4D99 0
1300 = 6B22 8
1310 = 99D0 7
1320 = 11CF D
1330 = EC94 B
1340 = 7DB1 A
1350 = D443 3
1360 = 24BD E
1370 = 84AD 1
1380 = 7EC8 D
1390 = AD85 A
1400 = 4158 A
1410 = 2FAC 5
1420 = 4230 9
1430 = F748 F
1440 = ED0F B
1450 = 8881 6
1460 = C50F C
1470 =  664 1
1480 = 54F5 0
1490 = B4CD F
1500 = 6B6A C
1510 = 3A1D D
1520 = D214 3
1530 = 7B30 6
1540 = A6FD E
1550 = EAD5 6
1560 = E388 8
1570 = 98A6 1
1580 = D5EB 2
1590 = 8A3B A
1600 = 4D0D A
1610 = D14D 3
1620 = 7EB6 B
1630 =  FE6 E
1640 = E0E9 1
1650 = 3886 9
1660 = 335B 8
1670 = 7F1F 7
1680 = 61E0 1
1690 = AA69 A
1700 = 3C44 C
1710 = 6777 8
1720 = 71EF 7
1730 = EE10 7
1740 = E114 4
1750 = 27B4 0
1760 = 9B55 9
1770 = 90B4 3
1780 = 1D3B 9
1790 = 4C78 A
1800 = CF7A E
1810 = 88C0 9
1820 = 8827 C
1830 = D857 1
1840 = CE07 8
1850 =  DDE 9
1860 = C607 B
1870 = 22A9 A
1880 = 6D4F 4
1890 = 2F37 9
1900 = 76E5 2
1910 =  FBC 7
1920 = 421A 7
1930 = A795 8
1940 = 6F3A 9
1950 = 9F8A 5
1960 = 48EA 8
1970 = 4AFD 2
1980 =  2E5 3
1990 = EAAA 3
2000 = 3ECB 5
2010 = 8818 B
2020 =  E24 9
2030 = F8FB D
2040 = E053 2
2050 = 7119 E
2060 =  2FE A
2070 = DBED 7
2080 = FD12 2
2090 = E6CB E
2100 = D5B6 C
2110 = ED0F 3
2120 = 1BC6 3
2130 =  593 8
2140 = 2782 F
2150 = 70D4 6
2160 = E49C 2
2170 = 846B 0
2180 =  C0D E
2190 = C3DF F
2200 = 864B 0
2210 = 5CF0 9
2220 = D778 2
2230 = 91E4 5
2240 = A1AE A
2250 = CA98 5
2260 = 863B 0
2270 = D1FA 7
2280 =  8BF D
2290 = BDD0 F
2300 = 8DB9 E
2310 = 8770 0
2320 = 94BC 7
2330 = 3797 1
2340 = 8438 7
2350 = C88C 3
2360 = CA88 8
2370 = 735F 0
2380 =  6BA 2
2390 = 53E7 E
2400 = D9A3 0
2410 = 18BE F
2420 = D286 C
2430 = 343E F
2440 = E22D 1
2450 =  E72 4
2460 = 5EA7 E
2470 =  31A F
2480 = 7F59 E
2490 = A0D6 7
2500 = ACC6 D
2510 = 381E 0
2520 = 9EE1 2
2530 = 78BC A
2540 = 6876 8
2550 =  BF9 D
2560 = A35F 6
2570 = 119B 6
2580 = 6BAA 7
2590 = 9466 7
2600 = D2DF B
2610 = F003 0
2620 = 4980 4
2630 = 9C52 0
2640 = 5DD9 3
2650 = 1D25 0
2660 = AFF8 6
2670 = 3531 4
2680 = AA42 8
2690 = FB9C A
2700 = 75F9 2
2710 = 53C9 F
2720 = 94D5 E
2730 = EDFA C
2740 = 971A F
2750 =  835 D
2760 =  B43 3
2770 = DAB6 C
2780 = CA0A 9
2790 = B354 D
2800 = C37A 4
2810 = 4B42 C
2820 = 3886 D
2830 = E887 6
2840 = C6A5 A
2850 = E983 2
2860 = 88FD B
2870 = 1466 B
2880 = 2A5E 3
2890 = D1ED A
2900 = E69A 5
2910 = 58E1 6
2920 = 1887 A
2930 = CB9F B
2940 = 3646 B
2950 = 58C1 F
2960 = CDB5 1
2970 = A00C E
2980 = 265D 6
2990 = C779 8
3000 = FF39 6
3010 = 64B2 1
3020 = C5E4 9
3030 = 85C6 1
3040 = 20D3 8
3050 = 4B86 9
3060 = E0DA C
3070 = F811 4
3080 = 22D3 3
3090 = 5DEC 0
3100 = FD2E F
3110 = 87FF 4
3120 = 7538 5
3130 = 1F68 E
3140 = 7F6A B
```

This listing is included in this month's tape & disc offer. See order form on Page 167.

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Pineapple's unique method of storing the diagram information on disc means that the size of diagrams is limited only by the free space on disc, and not the amount of computer memory you have available. (A blank 80 track disc will allow up to 39 mode 0 screens of diagram).

The superb print routines supplied with the program enable large areas of the diagram to be printed in a single print run in a number of different sizes and rotated through 90 deg. if required. Full use can also be made of printers which have a wider than normal carriage available.

The program is fully compatible with the Marconi Tracker ball described below.

PLEASE STATE 40 or 80 TRACK DISC & WHETHER STANDARD BBC or MASTER VERSION IS REQUIRED

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MARCONI TRACKER BALL

This high quality device comes with it's own Icon Artmaster drawing program and utilities to enable it to be used in place of keyboard keys, joysticks, or with your own programs.

For Model B & B+ (with Icon Artmaster)	£60.00 + VAT	Bare Trackerball (no software)	£49.00 + VAT
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ADFS Utilities ROM

ADU is a new product which will prove invaluable to all users of the ADFS. (Including Winchester owners).

The ADU Rom allows direct access to utilities which previously required the use of the ADFS utilities disc.

Many novel features are included in the commands allowing such facilities as the copying of all the files on a DFS disc onto ADFS in a single pass and Backing up between discs of different size (including Winchesters).

There is also a very powerful sector editor with automatic correction of CRC bytes and a menu routine with over 30 possible operations on ADFS discs.

Please write or 'phone for more details.

PRICE £29.00 + VAT

PCB

This new release from Pineapple is a printed circuit board draughting aid which is aimed at producing complex double sided PCB's very rapidly using a standard BBC micro and any FX compatible dot-matrix printer.

The program is supplied on EPROM and will run with any 32k BBC micro (including Master series). Also supplied is a disc containing a sample PCB layout to demonstrate the programs features.

By using an EPROM for the program code the maximum amount of RAM is available for storing component location and ASCII identification files etc. (Up to 500 components and 500 ASCII component descriptions may be stored for a given layout). These is no limit to the number of tracks for a given PCB, although the maximum size of board is restricted to 8" * 5.6".

Using a mode 1 screen, tracks on the top side of the board are shown in red, while those on the underside are blue. Each side of the board may be shown individually or superimposed. A component placement screen allows component outlines to be drawn for silk screen purposes and component numbers entered on this screen may be displayed during track routing to aid identification of roundels.

The print routines allow separate printouts of each side of the PCB in a very accurate expanded definition 1:1 or 2:1 scale, enabling direct contact printing to be used on resist covered copper clad board.

This program has too many superb features to describe adequately here, so please write or 'phone for more information and sample prinouts.

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Converter leads to enable the Trackerball to run mouse software and the mouse to run trackerball software (inc. DIAGRAM). Please state which way round when ordering.

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LETTERS

£10 Prize letter

Modifications to Carousel

I HAVE modified the Teletext Carousel program published in the March 1987 issue of The Micro User *to work on the Acorn Adaptor with ATS rom. The changes are mainly in the PROCNEW section, although there is a correction to the incomplete last line of the old program.*

```
 20 REM TELETEXT CAROUSEL
 30 REM Modified by
 40 REM John Woodthorpe
 50 REM For Acorn Adaptor
+ ATS

 110 ON ERROR PROCOSCLI("T
TXON"):PROCOSCLI("HOFF"):IF
ERR<>17 AND ERR<>4 VDU7:RE
PORT:PRINT"Please press RE
TURN";:REPEAT UNTIL GET=13

 310 DEFPROCNEW
 320 PROCSURE:PROCTITLE:VD
U26
 330 PRINTTAB(0,5)CHR$131"
Which Channel? "CHR$135;:FO
R A%=0 TO 3:PRINTTAB(17);A%
+1;"=";CH$(A%):NEXT:PRINT'T
AB(20)"? ";
 340 REPEAT A=FNG-17:UNTIL
A>-1 AND A<4:VDU8,8,8:PRINT
CH$(A)
 350 PRINT''CHR$131"Please
enter Page Number"CHR$135;
:INPUTP$:*TTXON
 360 max%=(HIMEM-&100-stor
e%)DIV&400:PRINT'CHR$131"Ho
w many sub-pages (max ";max
%;")"CHR$135;:INPUTN%:IFN%>
max%ORN%<1:VDU7:PRINT'"OUT
OF RANGE":GOTO360
 370 PROCOSCLI(CH$(A))
 380 PRINT''CHR$134"SEARCH
ING":C%=9999:*HON
 390 FORP%=0TON%-1:a%=stor
e%+P%*&400
 400 PROCOSCLI("PAGE"+P$)
 410 PROCOSCLI("TRANSFER "
+STR$a%):sub%=a%?4
 420 IFC%=sub%THEN400ELSEC
%=sub%
 430 PROCOSCLI("DISPLAY "+
STR$a%)

 450 NEXT:*HOFF
 460 VDU7,12:PRINT''"Page
now stored in memory.":PROC
RETURN:*TTXOFF
 470 ENDPROC

 870 DATABBC1,BBC2,ITV,CH4
```

*The changes account for the way the ATS commands differ from the Morley. In line 350 *TTXON turns on the teletext reception, and *TTXOFF in line 460 turns it off.*

P100 CEEFAX 156 Fri 20 Mar 11:50/10
CEEFAX
BBC1
BBC2
News..........101
News..........201
Finance.......120
Finance.......220
Weather and
Funtime.......230
Travel........151
Home + Away...251
TV and Radio.170
TV and Radio.270
Full index....199
Full index....299
CEEFAX SPORT - BBC1 and BBC2 300
Travel
Weather
TV-Radio

**HON in line 380 prints the teletext header line (clock and changing page numbers) so you can see the page numbers cycling. *HOFF in line 450 stops this. Also the *HOFF in the error line switches the header off.*

*The TTXON is needed because the ATS rom crashes if you perform *HOFF if the rom is switched off.*

In line 390 the

```
a%=store%+P%*&400
```

simplifies the next few lines, saving typing and calculations.

The ATS does not allow wildcards in page numbers, line 400, but this does not matter here.

*There is no command to perform the Morley *SUBCODE in line 410. Instead the page must be saved to memory and the rolling sub-page number read from bytes 2 and 3 (after the two initial bytes – see page 41 of the ATS User Guide) of row zero of the transmitted page.*

The variable sub% *is the low byte of the sub-page number in binary-coded decimal, that is treat the hexadecimal number as if it were the decimal – sub-page 14 is represented by &14.*

Having said this, sub% *is here dealt with as an ordinary decimal integer, as the absolute sub-page number is immaterial – all that matters is that the same sub-page is not stored more than once to account for multiple transmissions.*

Line 420 takes care of this multiple transmission situation in the same way as the original program.

The program AUNOTES previously broadcast on Ceefax (to automatically download the teachers notes) can be modified to download all telesoftware by deleting

```
IF sta2$="NOTES"
```

in line 950, and changing the screen messages accordingly. – **John Woodthorpe, Rochdale, Lancs.**

Deleting the blanks

I RECENTLY bought an Epson EX800 printer with colour option kit to use with my BBC Micro.

When using Mini Office II in one of the menus there is a double height option, but when I use it letters and figures are split with a blank line between. Is the printer capable of double height letters?

Also, can colour be output from Mini Office II, particularly when using the word processor. –**R.A. Young, Morden, Surrey.**

● To prevent the blank line between double height characters, Database Software recommends you type:

```
*FX6,13
```

at the main menu before you do any printing. If this doesn't work use:

```
*FX6,10
```

Colour on your printer can be controlled from Mini Office II by using the embedded command CC27,114,n where different numbers substituted for n will give various colours as described in your printer manual.

Win a tenner

● **Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

Writers of the most interesting letters receive a £10 prize.

Chequered checker

YOUR reviewer rightly praised the technical aspects of Computer Concepts' Spellmaster rom. But one of the essentials of any dictionary is that the words it contains are correctly spelt.

Unfortunately Spellmaster contains several mistakes among its 58,500 words. Some errors are simple keyboard mistakes such as asepsic for aseptic, apocalyrtical for apocalyptical, kindl for kindle, and zoomes for zooms. Others are classic spelling errors of the very type which one hopes a spelling checker will find. Examples are rearrangment for rearrangement, refittment for refitment, suddeness for suddenness, and jewery for jewry.

There are also systematic grammatical errors. There are plural adjectives such as avians, plural plurals such as feets and pences, plural adverbs such as niggardlys and plural prepositions such as nors. There are also a lot of wrongly spelt plurals such as

LETTERS

couchs and apiarys. And there are wrong participles such as feeded, keeped, and the wonderful jailbreaked and narrativing.

In addition to these errors, there are a number of new words. My favourite from the 1.62 issue rom, unsportmanlikeing, has been removed from the 1.64 and later versions but abend, annciate, jedec, katen, lauderer, and twer remain.

Computer Concepts should get a lexicographer onto their staff who is as good as their excellent programmers. Meanwhile, I use my paper dictionary as referee. – **Paul Lewis.**

● Computer Concepts correct mistakes when they are notified and, in fact, some of these you mention are already corrected on later versions.

Fortunately the mistakes are on rarely used words so the rom is still a great asset to anyone who uses word processors.

Programming function keys

£10 Prize letter

USERS of Mini Office II may have been puzzled, as I was, as to how the function keys could be programmed to provide embedded commands in the Shift+Control mode.

*Eventually I found that all that is required is to enter the usual *Key command and press Return. This automatically programs the keys, so that they can be used in Edit mode by pressing the key in conjunction with Shift+Control, presumably by virtue of the Mini Office II software.*

The next problem was to include the required codes for starting and finishing the embedded commands. The base codes for the straight function keys have been altered and by experimentation I found that start embedded command was ¦!¦U and to finish use ¦!¦V.

*To save time after loading the program, a suitable file such as the one alongside can be typed into the word processor and saved as an Ascii file, then loaded using *EXEC at the main menu.*

The codes are the ones I need most. Other users could replace them with one appropriate for their use or printer. These are Epson compatible. – **Chris Eve, Whangarei, New Zealand.**

```
*KEY1 ¦!¦UCC27,69¦1¦V
*¦  Sets emphasised print
*KEY1 ¦!¦UCC27,45,1¦!¦V
*¦  Sets underline
*KEY2 ¦!¦UCC27,45,0¦!¦V
*¦  Ends underline
*KEY3 ¦!¦UCC27,52¦!¦V
*¦  Sets italics
*KEy4 ¦!¦UCC27,53¦!¦V
*¦  Ends italics
*KEY5 ¦!¦UCC27,87,1¦!¦V
*¦  Sets double width
*KEY6 ¦!¦UCC27,87,0¦!¦V
*¦  Ends double width
*KEY7 ¦!¦UCC15¦!¦V
*¦  Sets compressed
*KEY8 ¦!¦UCC18¦!¦V
*¦  Ends compressed
*KEY9 ¦!¦UCE1¦!¦V
*¦  Centres one line
```

Printing the date

*I HAVE discovered a useful undocumented feature of the version of View supplied with the Master 128k. The current date and/or time (from the battery-backed clock) can be printed in a header or footer with the use of the parameters ¦D and ¦T. The output is in the format produced by the commands *DATE and *TIME.* – **A.M. Collyer, Basingstoke, Hamps.**

Seeking more power

Since starting to use the View family of software it has become apparent to me that I will need to beef-up my computing power. At present I am using a Model B with a sideways rom board, printer and dual disc drive. I would like to know the most cost efficient way to upgrade my system. – **Geoffrey Smythe, Exeter, Devon.**

● You have two options – apart from buying a Master. You could buy a shadow screen ram board which will give you more memory, 26k in any mode, by stopping the higher screen modes from absorbing user memory. Secondly you could get the 6502 second processor which gives you more memory (30k in any screen mode) and operates at nearly twice the speed. Shadow ram is usually about £50 and a second processor is about £200.

Care with cables

ALL too often one has to complain about the level of service from firms today and so I feel it is only right to bring to your attention the example of one firm who provides an excellent service in a specialised field. I refer to Care Electronics who offer a range of switching devices and connecting cables.

Many such firms simply provide an of-the-shelf service – all too often at excessive prices. I have found that Care Electronics are prepared to go to a lot of trouble in preparing suitable cables for their customers.

My wife and I use two BBC Micros and Care Electronics were able to provide a very reasonably priced parallel T-Switch so that we could use either machine with one printer. Having recently obtained an Amstrad PC1512 I wanted to be able to link it to the T-Switch in place of one of the BBC Micros. Mr Bruley of Care Electronics spent a good deal of time establishing exactly what was required, with the result that when the cable was supplied – very quickly and at a price no higher than that asked for 'off-the-shelf' products – it worked perfectly. – **John Simpson, Shoreham-by-Sea, West Sussex.**

Running ViewSpell

I RECENTLY bought Viewspell by mail order from Peartree Computers. Before sending my order I rang up this office and confirmed that this would function properly in ADFS on my BBC Master 128.

When I tried to use the user dictionary the program failed. I rang up Peartree and was advised to return the package.

However, the same items came back to me, with a note stating that no defect was detected. After many more frustrating hours I rang up Peartree again and they reassured me that ViewSpell worked perfectly well in ADFS – but only if I did not use the user dictionary.

I explained that since I was writing a PhD thesis on monoclonal antibodies the software was quite useless without the user dictionary.

Peartree finally admitted that Acorn had been aware of this problem for some time and that Acorn would replace my Viewspell software with an ADFS version free of charge.

My letter to Acorn requesting confirmation of this good news is still unanswered many weeks later, and numerous expensive telephone calls have failed to get me past their friendly and talkative switchboard operator.

I am delighted to hear that your ViewSpell works on ADFS. Can you please make it work on mine? – **Erika Stephen, Glasgow.**

● *Rory McCloy replies:* First, ViewSpell will on work on 80 track discs and the ViewSpell disc must be in drive 0.

Before you copy the ViewSpell disc on to an ADFS

LETTERS

disc using the Copyfiles utility on the Welcome disc you must create the three sub-directories, O, W and T, with *CDIR.

You then copy the master 1 files from these three sub-directories to the new sub-directories on the ADFS disc.

The listing here gives you a !BOOT file which you can type into View and save as a text file. You can then *EXEC this file from the command mode of View.

It will automatically check the spelling of the file you have loaded in the View's memory and return you to View and search the marked text for words not recognised.

In this example I have copied the ViewSpell files into a directory called Spell with sub-directories $.Spell.W, $.Spell.O and $.Spell.T.

You have to create your user dictionary by using this command when in ViewSpell.

One reason ViewSpell crashes when you try to use your user dictionary could be the way you set up the PREFIX.

It is important to use the full tree description of the directories, and to have a full stop after the last directory.

Another error could be the total length of the PREFIX command which is limited to a total of 22 characters (including spaces).

This may become a problem when the file-specific name has to begin with the drive, for example,

```
PREFIX T :1.$.directory.
```

would be too long.

When specifying the name of your user dictionary, Home1 in my boot file, do not use any sub-directories since ViewSpell will automatically look under directory W.

Good luck with the monoclonal antibodies.

```
SA $.Spell.Temp1
*SPELL
PREFIX M $.Spell.
PREFIX U $.Spell.
PREFIX T $.Spell.
USER Home1
LOAD Temp1
CHECK
(leave blank lines)
MARK Temp2
*WORD
L $.Spell.Temp2
S #!
```

Taking care of chips

£10 Prize letter

REMOVING chips from their sockets requires an extractor or the very careful prising with a screwdriver. I would however like to put forward a less hazardous method.

Get some 12mm ribbon from a sewing or dress shop, cut some 15cm lengths and sew them into loops. This is then put around the rom/eprom before insertion and tucked neatly down the side of the chip.

When you need to remove the chip put your fingers through the loop and pull upwards gently and the rom will pop out. This is also handy for some badly designed Master cartridges. – **Kenneth Hardacre, Bridlington, East Yorkshire.**

● This is a great idea. We would suggest that slightly wider ribbon could be used and the pins pushed carefully through it to give support along the whole length of the chip.

Redundant tapes

MY 12-year-old son has received a tape version of a game for a birthday present. Unfortunately we have recently upgraded to a disc system and now find tapes a laborious way to load games.

I contacted the shop where it was purchased and asked if I could exchange it for the disc version and pay any extra cost involved.

They refused to help saying that they did not offer a disc upgrade service because the tape could not be sent to another customer as it was secondhand.

I can understand the latter point, but surely the material cost of the tape is minor compared to the author's royalties and could have been included in the upgrade cost.

Some software companies offer such a service in the interest of good customer relations.

I therefore find myself, I with a game that my children love to play, but have not got the patience to wait for it to load from tape.

At least with records you could make them into decorative plant pots. Have your readers any suggestions of what I can do with the tape? – **Mrs H. Brown, Stanford-Le-Hope, Essex.**

Planting a family tree

DO you know of any software or roms that would enable me to use my BBC Micro to store my family tree?

Secondly is it possible to program a Taxan printer to take smaller sheets of paper than standard? – **A.B. Leanord, Great Amwell, Herts.**

● We know of no rom-based family tree software, but Micro Aids, 25 Fore Street, Praze, Cornwall, TR14 0SX produce a disc-based one capable of holding 350 people on a BBC B and more than double this on a B+ or Master.

They have other versions under development and if you contact them they should be able to help.

On most word processors you can set the page and line lengths to suit any paper. If you have problems with "paper out" errors, just put a larger sheet of paper behind the small one.

Incomplete listing

WHEN I had typed in the Variable Compressor from the February 1987 issue of The Micro User, *I was baffled by the errors that were reported by the checks in the program.*

But after checking it with the original I couldn't find any errors at all. Eventually I discovered that line 1860 of the program is incomplete, because every time the low-byte of the variable varbase *is increased, the hi-byte is also increased. So change the line to:*

```
1860 SEC:ADC varbase:STA var-
base:BCC nextentry
```

This will also remove all the other errors which the check-procedure reports. – **A.C. de Vries, Netherlands.**

● Thank you to everyone who wrote in with this correction.

Copying from ADFS to DFS

IS THERE any way of copying a disc's contents from ADFS to DFS – can this be achieved with a single disc drive? – **David Williams, Halesowen, West Midlands.**

● To copy from ADFS to DFS, insert your ADFS disc and type *ADFS.

Then load the file to be transferred. Now replace the ADFS disc with a DFS disc and type:

```
*DISC
```

and save the file. To go the other way just reverse the process.

Using a dual drive system with a Master you can use the *MOVE command. With the ADFS disc in drive 0 and the DFS disc in drive 1 type

```
*MOVE name  -DISC-:1.name
```

This cues the temporary filing system of the Master.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

LETTERS

Security at risk

YOUR disc protection program in the April 1987 issue of The Micro User *was just what I have been looking for.*

However, is it possible to build a password routine into it, so that the person who owns the disc can access it but unauthorised persons can't? – **Howel Thomas, Sketty, Swansea.**

● The idea of the program is to make it as difficult as possible for people to break into the programs. Any password system would reduce security and, provided authors keep unprotected copies, is unnecessary.

Good service

FIRSTLY let me congratulate you on the new look. I am 72 years of age and I find, unlike S.Morcroft (April Letters) that the printing is a great improvement, and gives me no trouble at all.

I.S.Gibson of Maidstone complains of bad after-sales service. I purchased a Master last year and after a few days it packed up. I sent it to the dealer where I purchased it and after two weeks, and a lot of phone calls it came back worse. On the advice of Acorn I sent it to Technomatic. After a few days it was ready so I went to London to pick it up.

I was received with the greatest courtesy and the Master had been properly repaired, including another small fault which they had found on testing. I have had no further trouble. – **H. McDonald, Bexhill-on-Sea, East Sussex.**

Instant programs

IN the March 1987 edition of The Micro User, *the article about the Brighton Pavilion mentions that by setting links in the BBC Micro it is possible to have a program automatically executed on power-up.*

I have checked the various books that I have and can find no mention of how to do this. Please can you tell me how it's done? I have written sideways ram code that will autoboot on power-up, but I would prefer a better solution.

Also, is there any way to tell if there is a disc in the drive from a machine code program? And why do rom software suppliers not provide the alternative of having their products supplied on disc ready to be loaded into sideways ram instead of rom – it would presumably be a lot cheaper? – **John Steiert, Italy.**

● On the bottom right of the keyboard is a set of links which control power-up screen mode, disc drive speed and auto-booting. Details of what to do can be found in the Advanced User Guide for the BBC Micro. On the Master you can use the Configure command to set these – and many other – options.

Neither the DFS nor the ADFS have any way of telling if there is a disc in the drive, even though some disc drives do have a door-open signal.

It is true that rom images would be cheaper distributed on disc, but they would also be much easier to copy.

Bad deal

I GET quite annoyed when shopping for software and hardware in the few local computer shops in my area. The main complaint is about sales assistants who know little or nothing about computers or the software they are selling.

Recently I had to brave one such establishment to purchase a box of double density, double sided disks as these were "just as good" and I could "always take them out and turn them over".

I would be interested to know whether other readers feel the same way, as I resent being treated like the next mug on the conveyor belt. – **S. Gray, London.**

I came a purler

I SHOULD like to add my comments to those of Pete Smith concerning the Newsight knitting package.

I did have the opportunity to try this package out before buying, but in the time available, the full enormity of its failings did not become apparent: Only after the home trial did I realise that I had made an awful mistake.

My machine is a Master 128, on which the Toolkit rom will not work, but the other failings are exactly as your reviewer mentioned. The only pattern designer which is worth considering is the Tessellating routine, and this is not nearly as good as others I have seen.

The slowness of the program in working out the knitting instructions enables me to prepare, and eat, a meal in comfort while it is in progress.

I have not tried printing out the hand knitting instructions, but the ones for machine knitting take up some five pages or so of print – quite daunting – and it seems no provision for repeated rows is made.

You are supposed to be able to view the garment as it will appear when knitted, but not if the size is over 12. It would not work, even at this size, in my package.

The printer dump flatly refused to work correctly on my Epson FX80. The rendition of the colours in monochrome is very poor indeed; there is so little contrast that it is very difficult to judge the effect, even if the dump worked properly. I did report these points to Newsight, but with no result.

The fuss they make about their copyright, too. I cannot imagine who would want to copy it.

My commiserations to anyone who has bought this very overpriced package. – **Miss M.B. Dearlove, Chessington, Surrey.**

Useful tips for beginners

AFTER reading through the letter pages, I have noticed that most, if not all, the letters printed are for those people that have had a BBC Micro for a while and know the ropes, so to speak.

But people that are new to BBC computers aren't being helped much, so here are a few simple items to help them:

*To turn sound off, type *FX210,1 and to turn it on again type *FX210; To disable the Escape key type *FX14,6 and *FX13,6 to re-enable it; And to disable the editing keys use *FX4,1 – re-enable them with *FX4.*

When doing calculations Basic does multiplication or division first and then addition or subtraction.

So as to not lose a program when pressing Break by accident and having to type OLD, type:

```
*KEY10OLD¦M
```

To run the program automatically as well, type:

```
*KEY10OLD¦MRUN¦M
```

To list it automatically on Break, type:

```
*KEY10OLD¦MLIST¦M
```

and so on.

When listing a program, holding Shift and Control down together will pause the listing until you release one of them and typing LISTO 1 will put a space between line numbers and what is on the line. – **Paul Howieson, Portsmouth.**

● Do any other readers have any basic hints?

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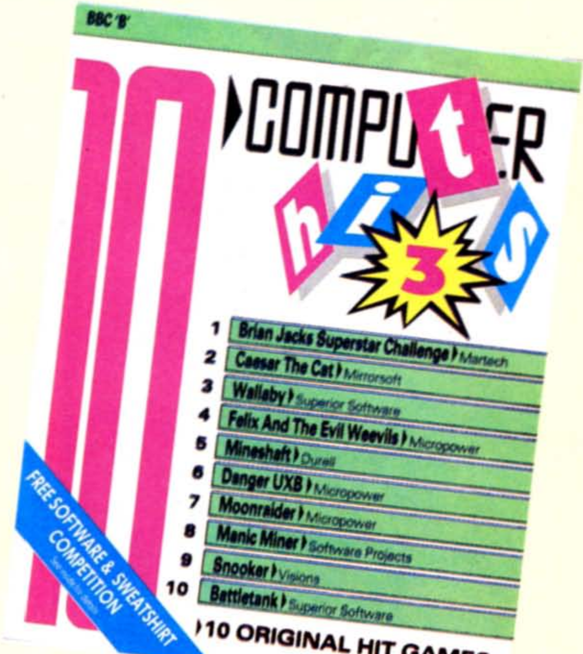
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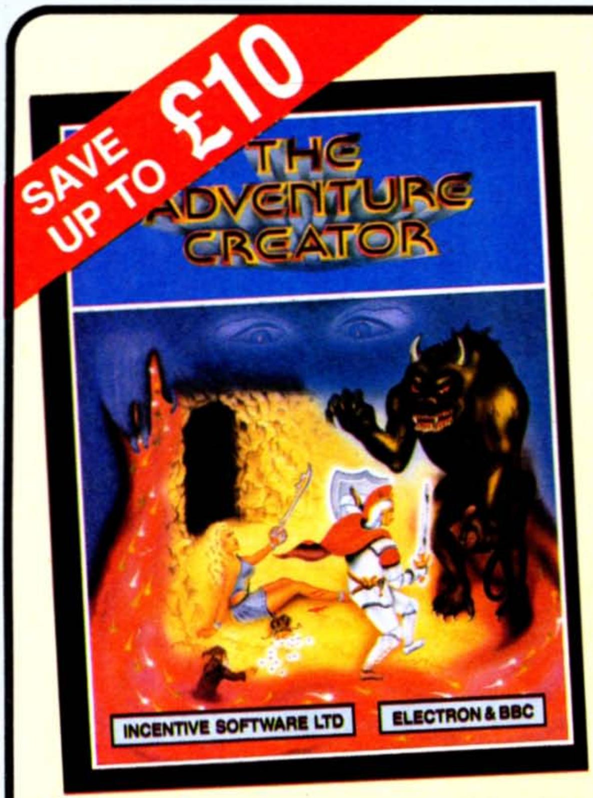
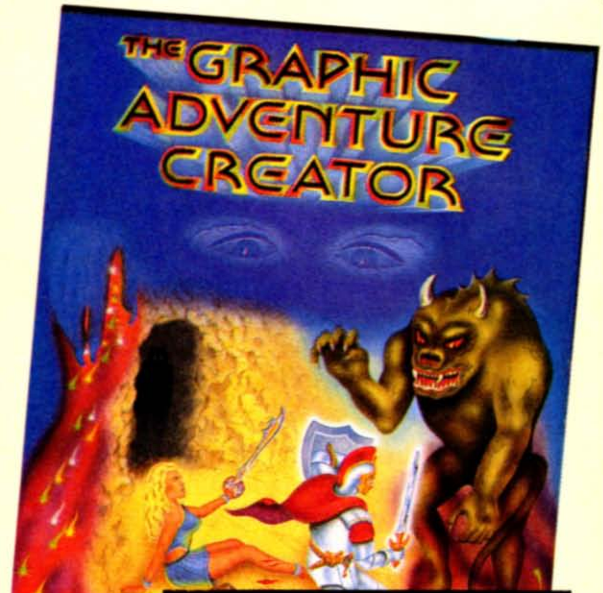
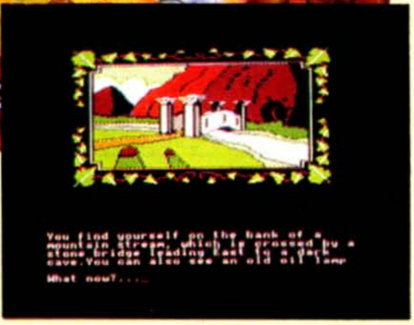
TO ORDER TURN TO THE FORM ON PAGE 167







```
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stone bridge leading East to a dark
cave.You can also see an old oil lamp

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```

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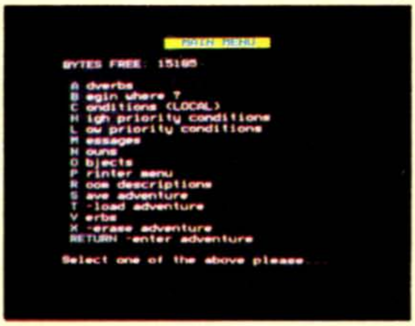

```
MAIN MENU

BYTES FREE: 15185

 A dverbs
 B egin where ?
 C onditions (LOCAL)
 H igh priority conditions
 L ow priority conditions
 M essages
 N ouns
 O bjects
 P rinter menu
 R oom descriptions
 S ave adventure
 T -load adventure
 V erbs
 X -erase adventure
 RETURN -enter adventure

Select one of the above please...
```

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M ✓

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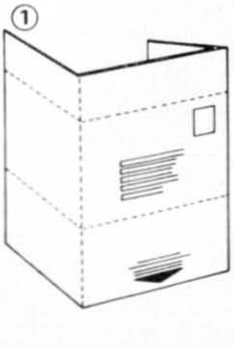

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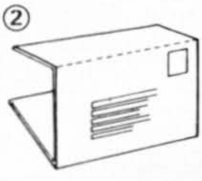

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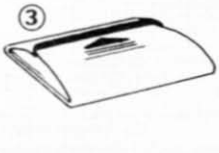

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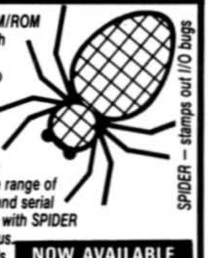

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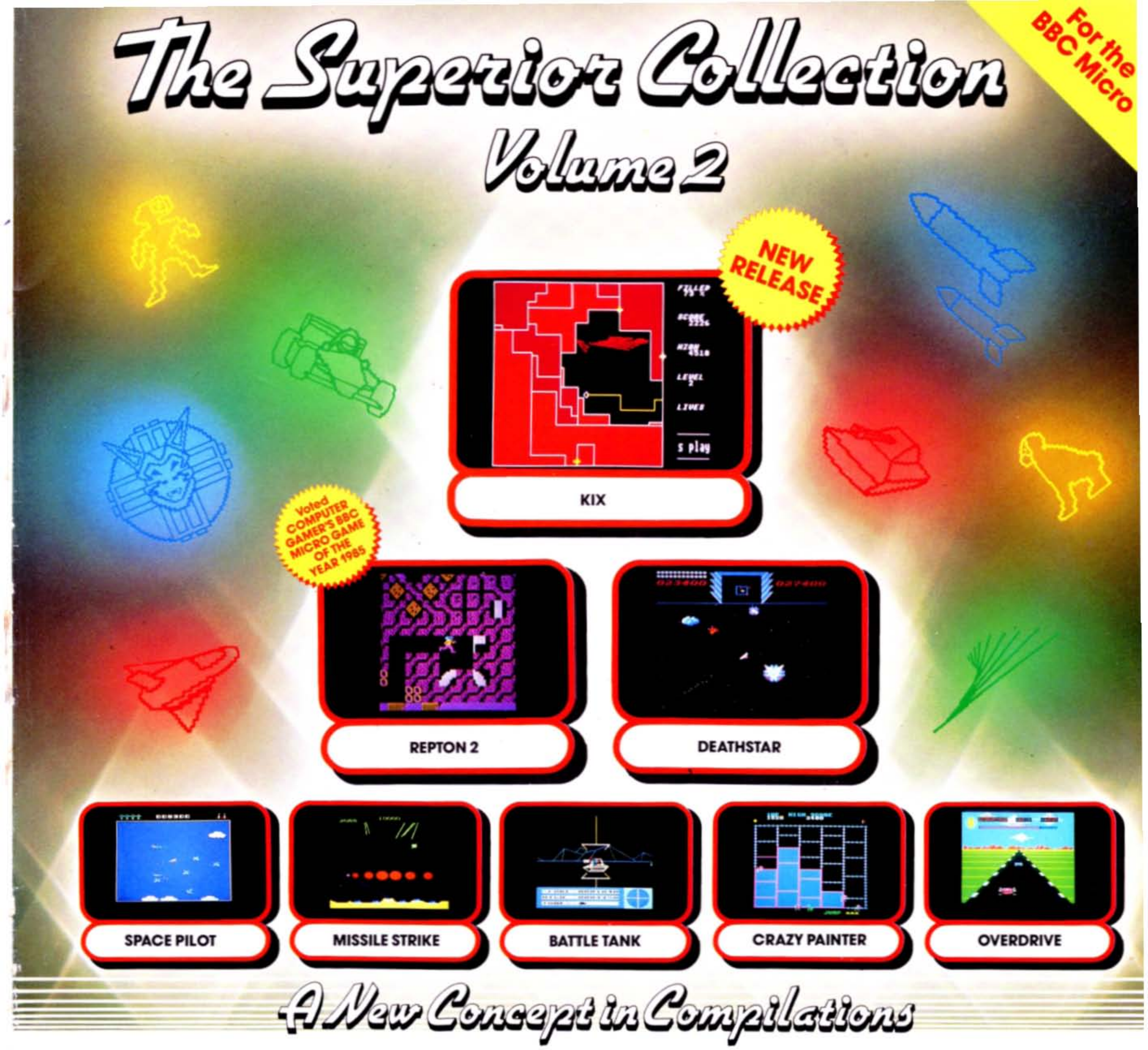

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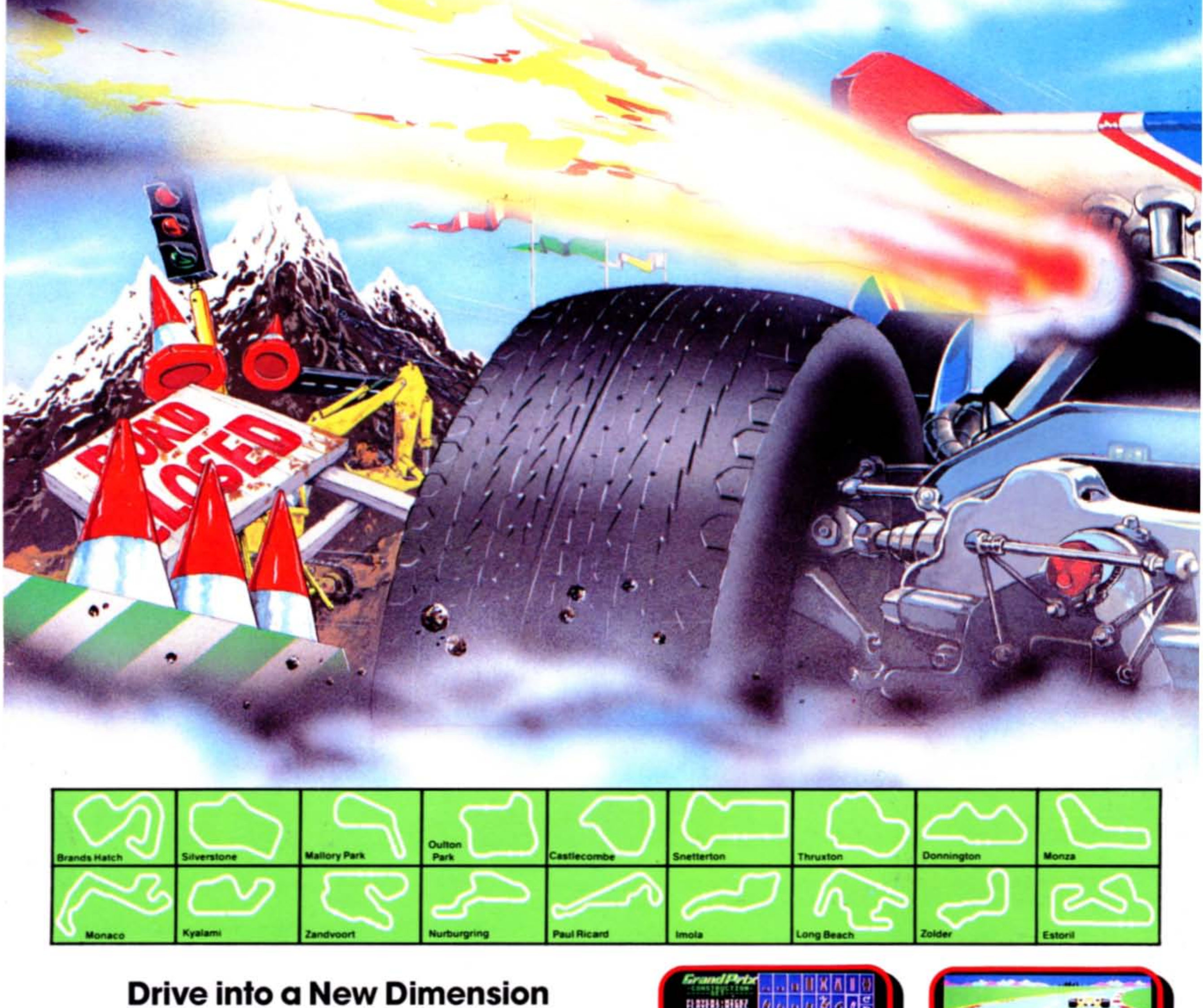
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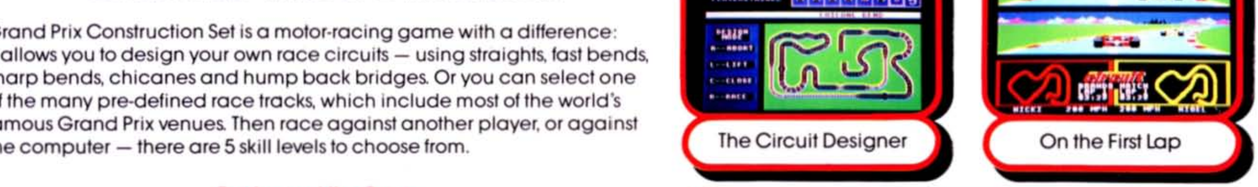
Brands Hatch
Silverstone
Mallory Park
Oulton Park
Castlecombe
Snetterton
Thruxton
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Monaco
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Paul Ricard
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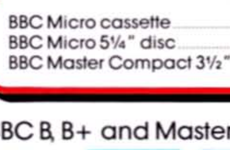
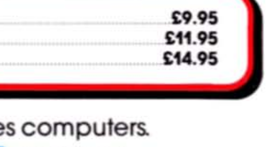
Drive into a New Dimension

Grand Prix Construction Set is a motor-racing game with a difference: it allows you to design your own race circuits — using straights, fast bends, sharp bends, chicanes and hump back bridges. Or you can select one of the many pre-defined race tracks, which include most of the world's famous Grand Prix venues. Then race against another player, or against the computer — there are 5 skill levels to choose from.



The Circuit Designer



On the First Lap

Features of the Game

- Easy-to-Use, Icon-Driven Circuit Designer
- Save and Load your own Track Designs
- 18 Pre-Defined Grand Prix Race Circuits
- 1-Player and 2-Player Options
- Spectacular Split-Screen View of the Race
- Dramatic Skids and Crashes

BBC Micro cassette	£9.95
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Grand Prix Construction Set is compatible with the BBC B, B+ and Master Series computers.

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